TECHNOLOGY

approach

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TECHNOLOGY DEPARTMENT

Letters

Current Weather—Method of Reporting

Sir:

APPROACH, March 1960, Page 26 refers to an incident wherein erroneous weather data was given to an aircraft approaching a station.

The Weather Service Office at this station has instituted a procedure whereby the possibility of such an occurrence has been reduced to an absolute minimum.

The instructions covering deteriorating weather reports are as follows:

Whenever field weather conditions are forecast to decrease to 1000 feet (ceiling) and 1½ miles (visibility) a qualified observer will be stationed in the Tower and will give continuous observational data to the tower operators and, in the most expeditious manner possible, to GCA.

A. Y. PARUNAK
CO, NAS

Atsugi, Japan

Thunderstorm Flying

Sir:

Your May issue of APPROACH was full of excellent and interesting material on Thunderstorms. The problem of high altitude flameouts that you mention on page 15 has also plagued the Air Force.

We presently are operating a Task Force of three aircraft in the Oklahoma City area for the purpose of penetrating thunderstorms for the National Severe Local Storm Research Project. The flameout problem is one of our points of interest. If there are any particular areas we could look into for you during our work that are amenable with our program, we would be glad to furnish you any information we might collect.

A. C. JACKSON, JR., LTCOL
Wright Patterson AFB, Ohio

Fire Fighting Indoctrination

Sir:

A two-day fire-fighting rescue indoctrination training session sponsored by the Aviation Safety Officers and Naval Air Station Glynco Fire Department drew an estimated crowd of 80 policemen and firefighters from the Glynn-McIntosh County area.

The training session was designed to better acquaint the civilian police and fire-fighting agencies with the problems of aircraft fires in the event of an off-station crash, in an effort to bring closer liaison and joint effort between the civilian agencies and the Navy.

The training sessions included lectures and demonstrations of ejection seats, fuel tank locations, emergency exits, and magnesium components of aircraft currently being used by the Navy at Glynco. Static displays of the WV–2 *Super*

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Drills and demonstrations such as this are an excellent opportunity to acquaint local civil police, firemen, officials and press with rescue techniques and hazards.

Constellation. F2H *Banshee*, and T2V jet trainer assisted in offering realistic training in the various aspects of aircraft fire fighting.

As a climax to the training session, an airborne helicopter crash/fire fighting unit demonstration by the fire department and crash crew gave the spectators first-hand information of the do's and don'ts in fighting aircraft fires.

A.S.O.

Late Schedules

Sir:

I would like to call attention to one safety of flight hazard that I have found exists in VS-ASW operations from the carrier. This hazard is generated by excessive delay in publishing of the ship's flight operations schedule. This schedule often is not distributed until after 2200. By the time the squadron prepares their schedule from the ship's it is often after 0100. This in itself is not hazardous but when the schedule calls for briefing 20 crewmembers as early as 0530 and some of the members of that crew are by necessity involved in the preparation of the schedule, it is an unnecessary hazard.

Occasionally the schedule will originate with a brief at 0230 and when this schedule is not published until 2200 it usually catches many crews not napping as they should be.

I understand from investigation of this problem that the primary corrective action must come from the CarDiv's staffs. It is requested that type commanders establish a deadline for the publishing of carrier flight operations schedules or at least encourage staffs not to delay the publishing of the schedule whenever possible.

SPEEDY

Strayed Away

Sir:

As a member of "The-Under-200 Pounds-in-the-Sump-Club" let me sympathize with (Anymouse, page 14, April APPROACH). Let me suggest several items for thought.

First, the FJ-4B has a history of fuel transfer troubles and North American can explain quite lucidly why the low level light occasionally does not perform its intended function. The tanker can also, with bad luck, transfer *all* his sump fuel to the receiver aircraft if his transfer float switches don't quite line up, a fact of which our USAF exchange pilot became unpleasantly aware one Okinawa day. In any case, a review of the *NAA Service News* of about two years ago may be in order, since it explains the gravity feed feature of the FJ-4B fuel system, a feature which may (or may not) have prevented "Short Timer's" apprehensions.

Second, and more general. I recall the reception afforded two intrepid F6F pilots who had been weathered out of their home field on a test hop in spite of the long established admonition to stay within gliding distance of the field on test flights. Why, pray tell, was "Short Timer" so distant on a test hop that it took 500 pounds to get home (120 miles or more in IDLE, or 50 miles on the deck, if my memory serves me)?

Gliding distance from the field is a good rule, but even rudimentary airmanship often dictates much more rigid minima, especially with such a clean and far-gliding bird as the 4-Baker.

W. C. CHAPMAN, CDR
Air Officer

USS ESSEX (CVS-9)

P.S. Let me second Cdr. C. A. Brown's motion (Feb. issue) as to breaking flight records. "Ne'er truer words were spoke."

Hep-Less

Sir:

The hot weather period is back with us again. This was brought home to me when I landed at an air base at a high elevation recently. The temperature and pressure altitude, on the no-wind takeoff chart, placed me in a *not recommended* situation. Added to the situation was a bad crosswind condition which could not be computed on the charts.

While I had another cup of coffee and waited for the temperature to decrease, two other pilots started to file out in an aircraft the same as mine, F9F-8T. I noted that on their DD-175 the pilot had put down the takeoff roll to be 6000 feet. I had computed 7500-plus in a no-wind condition. When I asked him how he had computed his figure, he said it was just a good guesstimation . . . I asked if he had a takeoff roll chart and of course he said no. I also asked what his minimum line speed was going to be, and he asked me what minimum line speed was!!!

Later, another -8T pilot approached me to ask if I knew how to read the takeoff roll chart. I found out that this man also did not know what his minimum line speed was.

This all boils down to the fact that people who are reputed to be qualified in type for cross-country flying are leaping off from high altitude stations:

(1) without having proper charts and performance data;
(2) without having the knowledge to read and utilize the information;
(3) without being able to ascertain, after rolling down the

runway, their ability to become safely airborne prior to passing a "go/no-go" position.

It is very confusing to find that the F9F-8T Supplement is still classified and cannot be generally publicized without a violation of security: What Gives?

DONALD C. MORGAN, CAPT USMC
VMT-2

● **Congratulation on your wise (in)action; hope you succeeded in "converting" the other two pilots by teaching them what they should have known before leaving home. As for the crosswind, we're sending you a kneeboard chart for deriving crosswind component; other readers can obtain them just by dropping us a note. The -8T is a training version of a combat aircraft, which is probably why the Supplement remains classified. But have you obtained a copy of the kneepad check list, NavAer 01-85FGH-1B, which is unclassified and which contains takeoff, landing, range and endurance data? Also, BuWeps (RAPP-51) has recently made available a circular Runway Distance Computer, unclassified, for the F9F-8/8T/8B/8P which enables you to crank out refusal and line speeds and takeoff/landing distances. They can be ordered from NSC Norfolk or Oakland. BuWeps will be interested in your comments on the computer, as they're working on one for the F8U-1 & -2 now. Keep up the good missionary work by continuing to educate the less "hep" pilots!**

P.S. For a listing of computers available for either fixed or rotary winged aircraft, see BuWeps Inst. 13910.1.

Misuse of Guard

Sir:

Frequency 121.5 is, as you know, for civil and military both. Use of 121.5 for civil use is slightly less restricted and there are times when you will hear words of a non-emergency nature on that channel. But, 243.0 is strictly military: Use, or misuse and the enforcement thereof is right in our own bailiwick.

The discussion and complaints regarding authorized or unauthorized usage of the GUARD channel —243.0 or 121.5 mcs—seems to go on ad infinitum and to date little or no improvement has been noticed. Reporting of violators has apparently had no effect since similar violations continue to occur day after day.

In this area while attempting to conduct intercepts as part of the training mission of this command, the intercept pilot must frequently turn off GUARD in order to hear his radar controller. The most aggravating and often recurring chatter involves clearance and traffic information passed by FAA stations and various local approach controllers to aircraft apparently unable to communicate on the prescribed channels.

One cannot help but wonder how these aircraft were ever cleared in the first place. In frequency of occurrence the above is closely followed by the lengthy and repeated testing of GUARD by the multitude of control towers, GCA units, etc., in a particular area.

A further example: a recent air search on the *day following* an accident in an adjacent area blocked 243.0 for lengthy periods while the airborne search coordinator discussed area searched, success probability, future intentions, etc. with a searching helicopter. (Why 282.8 or some other frequency was not employed is unknown.)

Until the various controlling agencies—civilian or military—*educate* personnel and *enforce* common sense restrictions on the use of the emergency frequency, GUARD channel will continue to be used as a handy common frequency for the interchange of non-emergency information. And unfortunately, pilots will still be forced to monitor this frequency haphazardly — and be tempted to use secondary but uncluttered channels in distress.

N. W. FREES, JR., LCDR
Av Saf Officer
U. S. Naval CIC School
NAS Glynco, Georgia

Quality Control

Sir:

I'd like to put my two cents in on this "Quality Control" bit. *Procedure*, I believe, is the answer. Not procedure in the sense that everyone must do a job in one specific manner, but that everyone will end up with the desired result. It is up to each and every individual, starting from the engineering officer on down to the lowest rated man on the flight line to insure that this is so. I think this should apply double to any accessory or item that is to be a spare or stored for future use in any aircraft.

The wheel and tire are a good example to use because of frequency of use and a lot of troubles could be solved by a definite procedure on tire build-up. If, for instance, one of the powers-that-be were to put out a proclamation stating that no tire, large or small, will be built-up unless it is built-up completely and tagged with the following information: date the tire was built, when lubricated, who did the work and who inspected the work . . . then we might have less accidents and more safety and of course more availability. *And*, the "mech" on the line would be sure he has a complete tire and wouldn't have to steal the bearing or what-have-you from the old tire.

JAMES J. KILLEAN, A/SGT
Navy 990, FPO San Francisco

● **Your two cents may save us a million bucks, Sarge. Consider your money/advice invested well.**

Yellow Sheet Write-Ups

Sir:

Your article on pages 22-25 of April 1960 issue of APPROACH proved very interesting and timely. A recent strike accident in this area exposed a typical case of lack of complete discrepancy write-up by the pilot, and an inadequate write-off by maintenance.

Your note at top of page states that yellow-sheet entries are the initial inputs to detailed, complex records system. These entries are considered more important than that, and are the foundation upon which corrective aircraft maintenance is based. Discrepancy write-ups must be sufficiently detailed such that corrective maintenance may be accomplished in a logical manner.

Another yellow-sheet BOO-BOO not noted on pages 24-25 is the omission by maintenance of the circle of the Pilot's "X" when action taken corrects a grounding discrepancy.

A. M. CARTER, JR, CDR
FAir, Hawaii

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U.S. Naval Aviation Safety Center.

Sucked In

Sir:

During our last drill weekend I read with interest your article "And Then the Fun Began" in the March 1960 issue of APPROACH.

The recommendation of the plane guard destroyer skipper that "survivors be picked up by the ship in lieu of the whaleboat" is a good one with one exception. A ship should not go alongside a survivor who might still be wearing a parachute! This situation occurred during WWII when my ship USS HIGBEE in company with another destroyer made a rescue attempt off Japan. Two F4Fs had collided and one parachute had opened. As we approached the survivor in the water, the other ship signaled that she would make the pickup. We were close enough to see that the survivor was alive, though probably injured. As the other ship came alongside the man in the water and stopped, he disappeared below the surface!

We later learned that the chute had been sucked into the intake of the main engine circulating pump which was started as soon as the engine room of the destroyer got a stop bell. The destroyer condensers depend on forward motion to ram cooling water through them until the ship stops. Then in order to maintain sufficient flow through the condensers it is necessary to start high capacity pumps. The only alternative for the engineering department would be to secure the main engines!

So—unless it can *definitely be determined that the survivor is not wearing an open chute*, which may be trailing below him in the water, I would say that *the ship should not go alongside and stop.*

L. H. WILSON, LCDR

VS-743, NARTU
NAS Jacksonville

● **Right—when the ship slows to 5-6 knots the pumps cut in. They pump 16-20,000 gals intake per min. The intakes are about 36" in dia., while screened, suction is obviously sufficient to cause trouble. This type intake is found on any steam driven ship—destroyer, destroyer escort, etc.—**

HEFOE

Sir:

The requirement for a system of emergency signals between aircraft for joint usage throughout the services: VMT-1 adopted the HEFOE ([R] is night radio failure signal—six dashes) fingers and light system method (March "Flying Safety") as SOP. This system has considerable usage in the Air Force, is easy to teach, easy to interpret day or night, and best of all, retention is easy. We suggest this be pushed as a standard for joint usage throughout the services.

SAFETY OFFICER

● **Roger—See AF Signals, below.**

HEFOE

HAND signals are important when driving both ground and air vehicles. Sometimes we who fly forget hand signals which are not used very often and at critical moments our forgetfulness can result in the loss of an aircraft.

Recently a T-33 pilot on an IFR/VFR-on-top navigational flight lost his electrical system. He was fortunate enough to see another T-Bird, latched onto the wing in right formation, and attempted to tell the pilot by sign talk that he had electrical failure and wanted to penetrate the undercast in formation. The lead T-33 pilot assumed that his newly acquired wingman had radio failure only, and was very accommodating in trying to get him safely down—except for one thing.

As the leader throttled back and popped the speed brakes the wingman overshot to the extent that he lost the lead aircraft because without electrical power, the speed brakes cannot be actuated. To make a long story short the wingman finally was forced to eject because he was without flight instruments.

Had the wingman used the proper hand signal (and had the leader understood the signal) it is probable that the penetration could have been safely completed, and one T-33 aircraft saved.

We have a system known as HEFOE, identified by patting the top of the head with the hand and holding up the appropriate number of fingers to denote the nature of the emergency. The procedure is as follows:

Hydraulic	one finger
Electrical	two fingers
Fuel	three fingers
Oxygen	four fingers
Engine	five fingers

The signals should be relayed by each member of the flight (if more than two aircraft) to make sure that each pilot receives them.

Electrical system failure may also be indicated by the pilot clenching his fist and holding it at the top of the canopy. AF Reg. 60-15, dated 18 November 1958, lists the standard hand signals that are common to all aircraft. Each unit should place emphasis on those signals pertinent to its specific aircraft. Your responsibility is then twofold: first, know the aircraft you are operating; second, if you must talk about it with your hands, know your sign language!—*USAF "Flying Safety"*

'There she goes!'

By C. O. "Chuck" Miller

Chief, Operational Factors & Reliability
Vought Aeronautics Division
Chance Vought Aircraft, Incorporated

With Marine Corps piloting experience in World War II, an Aeronautical Engineering degree from MIT, Chuck joined CVA as a test pilot in 1950 and was attached to the Regulus missile flight test program. In 1953 he became the Staff Engineer, Cockpit Design and Flight Safety, with responsibilities in many varied fields but especially human factors and accident prevention. As a participant in countless *Cutlass* and *Crusader* squadron briefings and as head of the Vought accident investigation team, he has promoted close liaison between the design engineer and the operating personnel in the field.

THIS article could just as well be entitled "Whoops" or perhaps more realistically X!&#X!! The latter reaction occurs in that familiar situation where you've just been jumped by some egomaniac who's trying to display his superb airmanship; but about the time you have the so-and-so nailed, the earth and sky suddenly exchange places with downright impolite rapidity.

Of course, I'm talking about an accelerated stall in a tactics maneuver (that's Commander talk for rat race!) complete with snaps, gyrations, incipient spins, or what have you.

Of course, I'm also talking about what can—and has—happened in so-called normal gunnery runs in the transonic range, or while exploring the V-n diagram the real way—in flight.

What does this have to do with aviation safety? Sure we've been stalling aircraft with a heavy hand since Grandpaw Pettibone was in Primary with Orville and Wilbur. But new ways of fouling things up occur every day, and sometimes they can be more dangerous than the good old days routine.

Case I

At 40,000 feet, the *Crusader* was placed in high g, constant altitude turn at slightly more than 1.0 M. This was a familiarization flight for the pilot who, though experienced in other aircraft, had limited time in the F8U. After stabilizing

the U-bird in the turn, the pilot carefully monitored the accelerometer but suddenly the aircraft went into uncontrolled flight with resultant series of motions being described by the chase pilot as "a weird series of gyrations lasting 7-8 seconds." The fam student became immediately disoriented and buffeted to the point he started reaching for the curtain. Finally, grasping it, he made one last check of the situation and found the aircraft in a diving situation but reasonably stabilized. He brought it home.

Case II

An experienced F8U pilot was making high g supersonic gunnery runs above 30,000 feet. These had been highly successful to the point of becoming almost routine. Experimenting with altitude advantage effects, the pilot began a run which resulted in a flat approach. There was no trouble in holding the rather high g however, so the run was pressed home.

Suddenly the aircraft snapped with such violent force that the pilot found himself grasping around the cockpit with his left hand for something to cushion the effects of the gyrations. In the process something snagged and actuated the canopy jettison handle! His right hand was busy too, trying spin recovery techniques which were eventually successful a dozen or so turns later. He brought this one home too.

Now the aerodynamics weenies can explain all this. In some aircraft, an accelerated stall is marked by severe pitchup which results from many combined effects, not the least of which are the initial stalling of the swept back wingtips, the effects of the wing center of pressure movement, and downwash over the particular horizontal tail installation.

In the F8U, with the pitchup problem eliminated by a combination of wingtip chord extensions and basic configuration, other factors are more predominant during the stall. The handbook mentions wing wobble, oscillations in yaw, and porpoising. Could be that any or all combinations will be there depending on the initial conditions. One thing that is always there (so they say) is the pre-stall buffet. But the onset *can* come with such rapidity that one is not forewarned. But let's examine this a little closer in the transonic range.

Looking at Figure (1) we see a plot of stalling angle of attack and buffet boundary plotted against Mach. No. for a typical high performance aircraft at a medium high altitude. For reference purposes, we also show its relationship to the more familiar V-n diagram.

First, notice the angle of attack, at which the aircraft would have to be flown to maintain, say, a 5-g turn at constant altitude around 1.0 MN. Note

Continued next page

that angle of attack increases sharply as you decelerate into the subsonic range. But surprisingly enough, even though this increased angle of attack is required, a pilot will find it necessary to ease forward on the stick—if anything—to maintain constant g. This is due to the forward travel of the wing center of pressure which results in more g per given tail deflection as you go subsonic—or to put it another way—higher apparent tail effectiveness as you go from just above 1.0 M to the barely subsonic area.*

Actually for practical purposes, a pilot would "fly" the g line rather than an attitude reference since he is sensing the load on his body, the stick force he holds, maybe the gyro pipper, and/or the accelerometer reading. He could not determine angle of attack by outside visual cues since they're moving so much and his angle of attack indicator is not accurate at high g.

It's also interesting to note that despite the easing forward of the stick, the stick force would be virtually unchanged in most control systems. In the subject case you would most likely find the feel force contribution from the bobweight far more predominant than that of the feel spring strut.

So much for the aerodynamics and control gobbledygook.

The catch in all this is the time it takes to get from Point A which is slightly supersonic, to Point C, where the sky and ground are going to chase each other around. Bcause of the greatly increased drag in a turn, or to put it another way—the inability to maintain steady state flight with thrust—the time from A to C may be as little as 5 seconds.

What's worse is the location of Point B—the presumed point of where the buffet warning is encountered. This is really hard to pin down. Even if you were able to conveniently flight test it—and it's not easy to set up these conditions just right—the establishment of buffet onset is an extremely subjective, elusive thing within the limits we're talking here. What one pilot will call onset at Point B, another will call onset at B′. Couple this with the rate at which you approach the buffet and minute differences in configuration between aircraft and you can see what a variable you're up against.

The lesson however becomes clear. The time for buffet warning may be very small—certainly on the order of a couple of seconds for the situation described above.

*For the intelligentsia in the crowd, consider this: although tail effectiveness relative to dynamic pressure will be somewhat lower as sped decreases, the moment from the wing which is to be balanced is markedly lowered too by the c.p. shift. Therefore, the apparent tail effectiveness is higher. If you want more detail than this, the editors will have to allow me to do another article!

And, just for the record, if you assume a given g value and a level altitude turn, the problem of buffet discrimination becomes more difficult as you go higher. As the aerodynamicist indicates, the buffet is there; but our concern is, will it be detected?

Well, we know that once in a great while, a pilot thinks of something besides looking for buffet, wing drop, yaw, etc., etc. In the situation noted in paragraph 1, I'm sure you'd be thinking of just how you are going to spread the word that night at the O-Club bar about the clown who was so stupid as to jump you! Or maybe you'd been thinking of that airline stewardess (or secretary) you'd met last time in Dallas, and you were just plain mad at the joker for interrupting your dream! Let's just say you were thinking of other things besides buffet onset.

The second point on what happens is a matter of reaction time. The head shrinkers agree that perceiving, deciding, and acting in a reasonably anticipated situation can be done in a fraction of a second with a well-trained individual.

In the case of a man who is preoccupied with something else—experienced or inexperienced, pilot or non pilot—it is recognized that a few seconds—certainly not less than 2-3, are required to follow the perceive-decide-react path to corrective action when something totally unexpected occurs. And this can have the person immobile for much longer than he consciously realizes. As a matter of fact, he may miss the initial buffet stimulus completely.

So here we are in the transonic stall situation; if close—repeat close—attention is not paid, the stall can be entered without any practical warning, and your response time can indeed be a variable.

A related input here too is what you do when things start to go ape—in terms of habit pattern. Consider wing drop in the early stages of the stall. With hundreds or thousands of hours of flight experience under your belt, it takes a tepid tiger indeed to *be able to* resist countering the wing drop with aileron. And, of course, if you ever do get aileron in at this point, in the *Crusader* as with most other aircraft, you are really inviting a spin.

Immediately after initial departure from controlled flight is recognized, the best solution is that old story about "relax and enjoy it." Give the beast a chance to right itself for awhile. If you are trimmed for something near normal flight conditions, the airplane will do a pretty good job by itself.

If you do not catch it early enough, and it progresses through the gyration phase into a spin, the handbook words about power off, emergency droop in the F8U, and correct control dis-

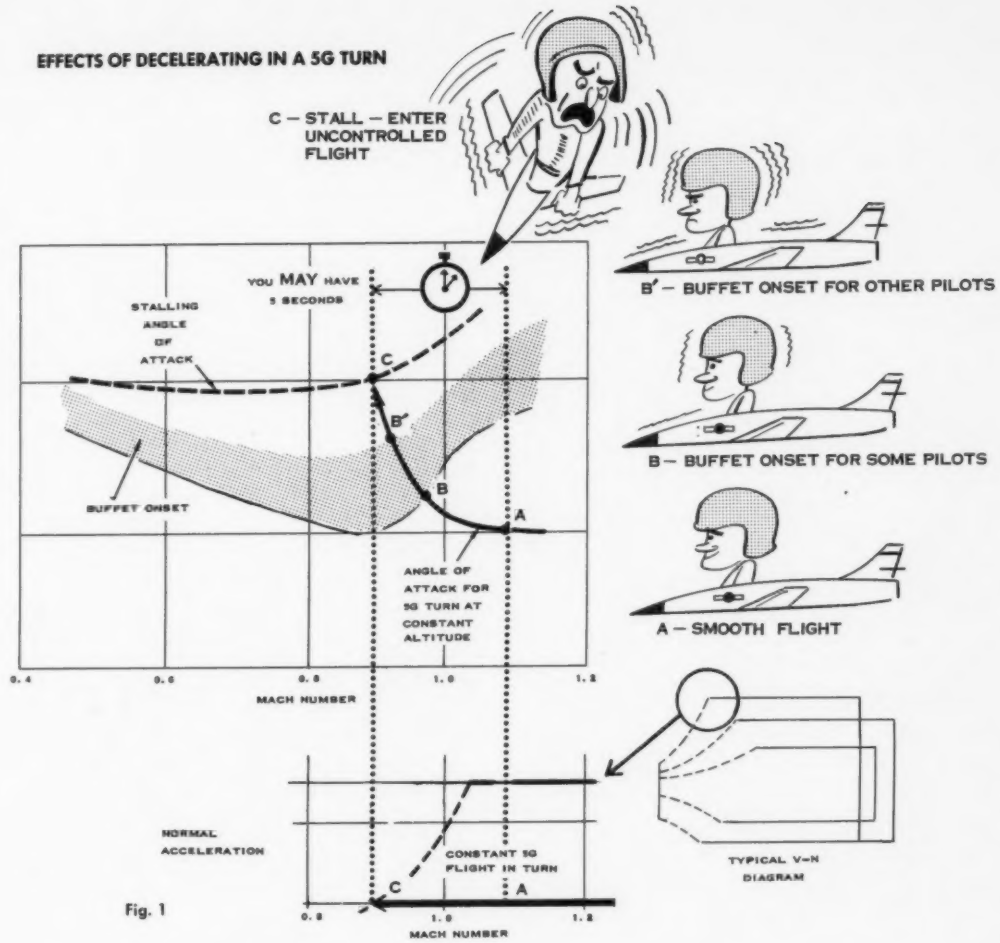

EFFECTS OF DECELERATING IN A 5G TURN
C – STALL – ENTER UNCONTROLLED FLIGHT
B' – BUFFET ONSET FOR OTHER PILOTS
B – BUFFET ONSET FOR SOME PILOTS
A – SMOOTH FLIGHT
YOU MAY HAVE 5 SECONDS
STALLING ANGLE OF ATTACK
ANGLE OF ATTACK
BUFFET ONSET
ANGLE OF ATTACK FOR 5G TURN AT CONSTANT ALTITUDE
MACH NUMBER
NORMAL ACCELERATION
CONSTANT 5G FLIGHT IN TURN
TYPICAL V-N DIAGRAM

Fig. 1

placements—*visually checked*—can be the difference between a simple embarrassing moment and your testing the aircraft's escape performance. Again, these unfamiliar conditions can fool you, so be deliberate in your actions and don't rush to any conclusions about aircraft response until you've given it a chance, altitude permitting.

Now there are positive preventive things in this accelerated stall business that are well within any pilot's capabilities to do. First of all, you can't stall the vehicle without up elevator. Don't be bashful about going forward on the stick when appropriate. Secondly, and of almost equal importance, nose position has a marked effect on deceleration rate in this transonic region. If thrust is marginal keep her going down hill a bit, and the accelerated stall shouldn't be any appreciable problem whatsoever.

There's one last point to consider in all this, and it almost falls into the category of preventive medicine. We're not naive enough to believe severe accelerated stalls will hereafter stop—anymore than Dr. Salk thinks polio is at an end. You had better be prepared for a few seconds of severe bouncing around if you snap any high performance aircraft. And being prepared means a correctly fitted torso harness, an anti-g suit, and a *locked* restraint system. An inertia reel is not designed to help you much in an oscillatory g field, so keep it locked if it is at all compatible with your size and mission you are to perform. This at least will keep you in a position where you can recover—one way or another.

It's a pleasure to do business with you!

BAILOUT OVER CORSICA

THE A3D-2 with pilot, bombardier-navigator and third crewman aboard was catapulted several minutes ahead of schedule. On the climb to 36,000 feet the pilot noticed stratus clouds around 1000 feet. "A fairly good haze layer down on deck," he thought recalling that the plane captain had commented that he had cleaned the windshield twice already but it kept misting over.

Visibility was 2 to 3 miles in haze. There was a full moon. A surface wind of from 10 to 15 knots ruffled the Mediterranean. The aircraft completed its mission as scheduled. However, on attempting to land aboard, he hit the ramp with tail skag and hook. After bolting, the aircraft was diverted to Ajaccio Airfield on Corsica.

After departing the area of the ship, the aircraft lost radio contact. Continuing on his original heading, the pilot checked the time. Over Corsica, on crossing a mountain ridge which looked suspiciously close to his 7000 feet indicated altitude, he was surprised to find a solid low stratus overcast all along the coast.

Suddenly through a hole in the overcast the pilot spotted a finger of land with a dozen or so lights on it. Checking the bombardier-navigator's WAC chart, he decided it looked like a peninsula lying about 15 miles south of Ajaccio. This agreed with his estimate of the aircraft's position. With no lights visible up ahead and no breaks in the overcast which was butted up against the mountains, the pilot decided to let down into the hole in an attempt to get underneath the stratus deck. He figured if the peninsula had been correctly identified, this would take him across a bay over open water to the southern approach to the field.

There still was no response to the pilot's repeated radio requests to Ajaccio tower for field lights and beacon and an emergency steer. (Later it was learned that although the current *RAD Facts and In-Flight Data Europe* indicated that Ajaccio facilities operated continuously, the facilities of the field were not in operation on this night. Subsequent investigation disclosed that the field normally operated from sunrise to sunset only.)

The pilot took the A3D down to 800 feet to get underneath the overcast. A minute later, he saw

a white line of surf dead ahead with mountains directly behind it. Executing an immediate climbing turn, he went back out to sea. On a second try he again encountered the surf line backed up by mountains.

With little visibility to either side, the pilot decided against paralleling such an uncertain coastline in the dark. He did a steep 180-degree turn, climbed back through the break and told the crew to prepare to bail out.

The pilot directed the two crewmembers to cinch up their parachute harnesses and to remain on ICS until he said "Go." He rolled the aircraft around to an easterly heading. As soon as he was certain he was over one ridge of mountains, he turned again and rolled the wings level. The bombardier-navigator blew the tunnel hatch open. All three men cinched up the straps on their hardhats.

During the final phase of flight, the pilot had contacted another aircraft on the guard channel. He stated he intended to bail the crew out as the A3D was rapidly approaching fuel exhaustion and they were unable to locate Ajaccio . . . Three souls on board . . . Best known position the west coast of Corsica . . . About 42 degrees north in the vicinity of Ajaccio.

Fuel was down to 600 pounds. Altitude, 8000 feet. At the word "Go" the third crewman went down the bailout chute followed almost immediately by the bombardier-navigator, then the pilot. (The narratives which follow are taken from the accident investigation.)

Third Crewman: "I pulled the ripcord immediately after clearing the plane and received a tremendous shock as the chute opened. I could see nothing below except heavy clouds. For several minutes after leaving the aircraft, I could hear the plane. It seemed to be circling around and coming back towards me. Then shortly afterward, I heard nothing. At approximately 5000 feet I encountered strong winds and oscillated quite severely, but this only lasted a short time and I resumed a normal descent. Although I was unable to sit back on the chute, I wasn't uncomfortable hanging by the straps. On the way down I removed my oxygen mask.

"I landed in the mountains—fully prepared for the sudden stop although just prior to landing, my chute began to oscillate again which made it difficult to judge distance. When I hit ground I must have sprained my right ankle. My left elbow hit a rock which broke the skin slightly. I removed my chute, hardhat and life vest, broke out my flashlight and climbed to the top of the hill to orient myself.

"The cloud formation was low. All I could see were mountain peaks in the vicinity. I blew my whistle in hope that the bombardier-navigator might be close by but got no answer. Then I stopped to smoke a cigaret and take stock of the situation. I worked my way back to the spot where I had landed. It was just beginning to get light. I decided the mountain peak to the northwest was more advantageous for being spotted from the air. (I used the compass on my life

vest to determine direction.) I laid my life vest and hardhat out in the shape of an arrow to indicate the way I had gone. I cut the shroudlines from my chute, bundled up the silk and tied it with one line. Then I made my way to the other mountain peak. I still could not see any signs of civilization.

"From my cloth map, I determined the approximate direction to the west coast but since my ankle was hurt I decided against trying to walk out. I spread my chute out to make it easy to see from the air. Then I moved to another rock formation about 50 feet away so a helicopter could pick me up without fear of lifting the chute into the rotor blades. After that I rested.

"I saw several A3Ds but only one came close to me and he did not see me when I signaled with my mirror. Then I heard another plane. As soon as it came over a peak to the east I signaled with my mirror. The plane, a TF from our carrier, spotted me and circled the area.

"I waited a considerable time but the helicopter I was expecting did not arrive. Then I heard shouts. Two Frenchmen were coming toward me. When they reached me, I found they spoke no English. I can't speak French. Anyway, I judged that they were going to lead me to a nearby village. It was a slow process as my right ankle was swollen and pained me at each step. One of the men cut a cane for me to make it easier. We walked about a mile to the main road where their car was parked. They took me to the village . . . "

* * *

Bombardier-Navigator: "As the third crewman went out, I shoved my seat back and got back to the escape chute. I turned my head and saw the pilot getting out of his seat. Then I left the aircraft.

"I went out the chute feet first and somersaulted backwards once. I saw the aircraft pass over me. I stabilized my falling face-down at about a 45-degree angle with my feet lower. Counting to 10 in an attempt to land near the third crewman, I pulled the D-ring until I felt the force of the pins. I thought that I had pulled it enough but since the chute didn't open, I gave another hard yank on it and the chute opened immediately. After I stabilized in the chute, I called out a couple of times to see if the third crewman or pilot was near but I didn't hear any answer. I couldn't see their chutes. I saw a WV-2. I also heard an A3D fairly near and thought that this was probably ours making a circle, but I didn't see it.

"On the way down I experienced severe oscillation that really frightened me. I found I could control the oscillation by pulling the front risers as the canopy went back so that problem was

solved. It seemed to me that it took quite a while to descend to the cloud layer.

"Passing through the overcast, I saw lights nearby and oriented them to a valley I seemed to be headed for. Shortly afterward, I landed on a ledge about two feet below what I was later told was a grain threshing platform. I fell forward and immediately started getting out of the chute. After I got out of the chute, I got up on the platform and checked over my survival gear. All I had lost was my compass and my knife.

"I fired one shot from my pistol in hope that the pilot and third crewman were nearby. I gave a couple of yells and blew my whistle, but there was no answer. I assumed they were on the other side of the mountain ridge from me. Then I sat down to wait until it got lighter so I could walk out to the lights in the valley. I took the flares from my life vest and started walking down the valley. I had to detour around several thickets of briars. After about ¾ of a mile I reached a road and started down it in what I thought was the direction of the lights I had seen. After a couple of hundred yards I met two Corsicans and got across to them who I was and that I wanted a telephone. They directed me to the village of Belvedere which was about 1 kilometer away . . . "

Pilot: "I went down the escape chute holding my D-ring with my right hand and my left arm draped over my head to hold my helmet on. I do not believe I touched the sides or bottom of the chute. I fell free of the aircraft and had the sensation of its passing nearness without actually seeing it. I continued falling flat on my back and then began to rotate slowly head over heels. The spinning began to increase rapidly and I was starting to get dizzy. I had been told that in this situation the best procedure is to spread-eagle your body and this is what I did. I let go of the D-ring and hardhat but it had no noticeable effect on my rate of spin. By this time, I wasn't too sure of up from down so I felt the time had come to open my chute. I did so with little or no effort. I heard the welcome pop of my parachute and immediately my spinning ceased. The force of the chute opening did not seem excessive at all. I found myself hanging by my harness at an altitude I would guess to have been about 6000 feet. I felt certain that due to my timing in bailing out I would probably land in the water. I started to look around to see if I could see anything. All I could see were some ridges of mountain peaks to my left and a stratus overcast directly beneath me and to my right.

"I was experiencing no oscillations and had no trouble at all in getting up and into the seat. I then released my leg straps and started to get my pararaft out. This required quite a bit of effort as the raft was wedged in there pretty securely. I felt like I was trying to pull a chair out from under myself. Finally, I managed to get the raft out and rather than drop it from its lanyard, I decided to hold it in my lap until I approached the surface of the water.

"Several times during the descent, I had the strange sensation that I wasn't actually descending at all but merely sitting on some sky hook. There was no feeling of motion. Not until I began to feel moisture particles dampening my face and saw the moon begin to cloud over did I become aware that I was entering the overcast. For a few seconds I could see practically nothing. I had the sensation of a white-out. Then glancing downward, I saw a wall of rock rushing up at me. From the various shades of grey and black and the way they seemed to fall away into nothingness, I felt certain I was going to land on a fairly steep slope just below a peak. I had probably a second or two to stare at the ground coming up. Realizing that I would have poor depth perception at best, I threw my life raft down ahead of me. Almost immediately I hit the ground. I felt a sharp twinge of pain in both feet and rolled over on my back. My parachute collapsed directly behind me. Feeling no motion or breeze, I just lay there for a second

hardly daring to believe I was all in one piece.

"After the shock of landing wore off, I unbuckled my harness and slowly began to move my limbs and body to see if anything felt broken. Nothing did so I sat up and turned on my flashlight to see what time it was and to repair my left shoestring which had broken when I landed. I felt certain my left ankle was sprained; I had no feeling in my toes. My right foot felt bruised but not injured. I took off my hardhat and at this time realized my pararaft was lying right on the ground beside me.

"I looked downhill. In the misty darkness I could only distinguish the outline of a ledge which led off into nothingness. It seemed like the crest of the ridge was only a short distance up above me so I decided I would work my way up to the top, fire off some tracers and attempt to establish contact with my two crewmembers. I was very alarmed over their status as I couldn't help but feel it would be a miracle if either of them should be as fortunate as I was to land on this terrain and still be in one piece.

"What had looked like 50 yards to the top of the mountain crest turned out to be about 550 yards. As I topped each crest there seemed to be another one just a little higher reaching up into the mist. The terrain was extremely rocky with large boulders and some scrub growth. I made uphill progress quite slowly. I think it took me about 45 minutes to reach the top. There I sat down on a large rock and fired off three rounds of tracer ammunition. I continued to blow my whistle at 2-minute intervals while I planned my next move. There was no reply to any of my signals. I looked down the opposite slope and since I could see little or nothing and did not hear any response to my signals, I decided to return down the slope I had landed on. I was quite certain I was very near the beach so I checked my compass and started walking westward down the slope. I traversed about twice the distance downhill that I had gone up. Then in the faint first light I could make out the

coastline. This encouraged me greatly and I continued on down the slope.

"I stopped once near some brush and fashioned myself a crutch. Unfortunately, it was about 6" too long. It was fine for taking the weight off my sprained ankle but as I would put my weight on it and bring my other foot forward, it tended to lift me off the ground and pitch me forward. Finally, I abandoned it.

"About halfway down the slope I came to a road. I saw a cow in the distance off to the left and went that way in the hope of locating a farmhouse. I had not gone too far when I came upon a small car parked at the edge of the road. There was a footpath leading up the mountainside. I followed it. On a little knoll I saw a small stone cottage. I hoped the owner of the car would be inside. I began to yell in French 'au secours' and 'aidez-moi' both of which I was certain were French for 'help.' I banged on the door and continued shouting for several minutes. Finally I heard movements inside.

"Soon a man came to the window. I asked him in French if he spoke English. He shook his head and I told him I spoke French poorly, that I wanted to locate a phone immediately and would he help me? He was quite wary and I could certainly understand his reasons. Then he and his wife came outside. She seemed to understand a little English. As best I could I explained to her what had happened and that it was a matter of great urgency that I get to a telephone immediately to make a report. I also wanted to get in touch with the local gendarmes and organize a search for the bombardier-navigator and third crewman as quickly as possible.

"They both went back in and dressed and I sat down and waited. My foot was starting to get stiff again from sitting and when we started down the path I was limping. As we walked by the car I gazed at it longingly and asked if it was working. My escorts shrugged their shoulders as if to signify that they did not understand and so we continued down the road to the village.

"About half way down the road I heard a plane overhead. It was a TF coming over a ridge out of the mist. I quickly got one of my flares out and pulled the day end. The pilot didn't see it. It was about 0545 and although I could see fairly well upwards toward the east, I think it would have been better if I used a night flare. I believe now that someone looking down onto the slopes at that hour of the morning would be more likely to see the brilliant light of a night flare than orange day smoke.

"On reaching the village we went to the Post Office where the only phone was located. I attempted to put through a call to Ajaccio Airport for further relay to any airborne aircraft or the ship. Much to my amazement, my bombardier-navigator was on the same party line. He was in a little village about two kilometers away trying to call Ajaccio to report the accident. He informed me he was uninjured and in good hands. I told him to stay put, that I would come to Belvedere where he was and organize a search party from there. I then put through my call to Ajaccio Airport and found myself talking to a lieutenant commander from our squadron. He informed me he was alerting personnel from his end and told me to take charge of organizing a search in Belvedere.

"I got transportation to Belvedere, located the bombardier-navigator and contacted the local schoolteacher (who spoke excellent English) in order to organize a search party. He informed me that several parties of gendarmes and local residents were already out scouring the area.

"At approximately 0900, a gendarme from one of the search parties reported they had located the third parachute and were searching nearby. Fifteen minutes later someone brought in the third crewman's parachute and at this time I went with the bombardier-navigator and some gendarmes to recover my parachute to avoid having an aircraft spot it and misdirect search parties. At 1000 a police car drove up with the third crewman aboard and in good shape.

"Shortly thereafter, several ADs flew low over the village and we all three stood out in the middle of the road and signaled to each of them with day-smoke signals and mirrors. I am certain several of them spotted us as they rocked their wings and made a second low pass with gear, flaps and speed brakes extended."

* * *

From Belvedere, the A3D crew was driven to Police Headquarters at Sartene. After a trip to the aircraft wreckage, they returned to Sartene where they were met by a lieutenant from the ship. The party then took a taxi to Ajaccio Airport where they boarded a TF and returned to the ship.

WHIZ QUIZ

1. In an aircraft equipped with an omni receiver, can you accept an inflight clearance to a VORTAC station?

2. Does the Enroute Supplement indicate which runway (s) GCA is oriented for?

3. What do the following abbreviations indicate when found in the Enroute Supplement or FPD?

a. bcst
b. bus
c. coml
d. CTA
e. ibnd
f. OT
g. PPO
h. QNH
i. QFE
j. rlcd
k. trans
l. VORW
m. R Bn (BMH)

4. Airborne without a let down plate in marginal VFR, will you normally have access to any document listing the exact bearing/distance from a navigational fix to an airport?

5. For a multi-piloted aircraft, what are the weather minimums for an airport served by an omni-approach (no radar or ILS) if it is to be used as an alternate on a IFR flight plan?

6. Spotting a thunderstorm buildup ahead, how can you readily ascertain if you are in an area served by pilot to forecaster or weather radar facilities?

7. Enroute on an IFR flight plan, you are held at several fixes until your filed ETA is over an hour in error. Will your destination be automatically notified by ATC of your delay?

8. In lost aircraft procedure, what frequency should you use to transmit the PAN or MAYDAY?

9. Flying a direct flight path between airways on an IFR clearance, what is your minimum enroute altitude?

10. Inbound to a fix on a Victor airway where the MEA (Minimum enroute altitude) and the MOCA (Minimum obstruction clearance altitude) differ, can you use the lower altitude (MOCA)?

11. You have declared yourself lost—inoperative navigational aids on top of an overcast—and Washington Center radar net vectors an interceptor to your assistance. The interceptor closes, takes position slightly ahead of you and then his lights go from STEADY to BLINKING for 30 seconds and then back to STEADY as he breaks formation. What does this sequence of actions on his part indicate?—*MCAS Quantico "The Sky Hook"*

Answers

1. Yes. VORTAC indicates a station equipped with a combination of VOR and TACAN. Therefore, you would receive the usual VOR azimuth indication.

2. Yes. Complete GCA information is found in the RADAR section including frequencies, minimums, etc.

3. a. bcst—broadcast
b. bus—business
c. coml—commercial
d. CTA—control area
e. ibnd—inbound
f. OT—other items
g. PPO—prior permission only
h. QNH—altimeter setting above MSL
i. QFE—altimeter set to standard pres.
j. rlcd—relocated
k. trans—transport
l. VORW—VOR station *without* voice facilities
m. R Bn—radio beacon of a non-directional less (BMH) than 50 watts class with a scheduled weather broadcast.

4. Yes. In addition to the information found on the Enroute Chart, the Enroute Supplement lists this information for all fixes near an airport. For example, the Brooke listing gives bearing/distance to Quantico while the Quantico listing gives bearing/distance to both Quantico and Dahlgren.

5. Published minimums plus 300 feet and one mile.

6. Commencing with the 27 Jan issue of the Enroute Supplement, a continental map has been included which depicts these facilities.

7. No. They will have to initiate their normal aircraft overdue procedures. Of course, air traffic control personnel will be aware of your position but they will not inform your destination until you request that your ETA be modified.

8. Use your normal air/ground frequency initially. If this doesn't raise anyone, switch to Guard channel.

9. Where no minimum enroute is established, flight must be conducted at an altitude not less than 1000 feet above the highest obstacle within a horizontal distance of 25 miles from centerline of course intended to be flown. Within areas designated as mountainous areas, a clearance of 2000 feet must be maintained.

10. Yes. If within 25 miles of the station both inbound and outbound flights can use the MOCA.

11. This action indicates that you should resume your distress orbit. Interceptor probably has some malfunction or fuel emergency and must leave you. These and other distress procedures can be found in the rear portion of the enroute supplement.

You Wrote the Caption

APPROACH *readers responded in grand style to our invitation to caption this photo of a misplaced F4D. Here are the ones we've received to date—if yours was late, try again with the next one.*

"All the way down I kept saying, 'I *won't* overshoot, I *won't* overshoot' . . . "—*AGySgt F. A. Joslin, VMF 235*

"Hey mister, get a horse!"—*Capt. L. T. Morse, NROTC Notre Dame*

"Needle-nose in a haystack!"—*Lcdr. D. J. DeBaets, USS* TARAWA

"Let's tow it out to sea, it's beginning to smell"—*Lcdr. G. R. Pool, NROTC Rensselaer*

"Funds may be short, but *this* will never replace arresting gear!"—

"Strike!—set 'em up in the other alley!"—*Cdr. G. B. Jansen, VW-13*

"I landed long, rolled off the end of the runway, across a road, through two fences . . . and then I lost control."—*AGySgt F. A. Joslin, VMF 235*

"Yes, he is impetuous, but Harry *never* misses these square dances . . . "—*R. L. Mix, AG1, FleWeaFac Seattle*

" . . . and all the time I thought they drank JP-5 and ate unwary line crewmen."—

"Who rigged that crazy barricade?"—*Cdr L. E. Kirk, Jr., Aide to SecNav*

"Wal, Henry, I might buy 'er, but she looks awful expensive to feed."—

"Good grief! You'd think they'd keep these taxiways cleaner than this"—

"Hold 'er head up Newt, she's tryin' to run!"—

"Tower, is this the quick refueling pit?"—*1/Lt R. J. Salley, MWHG, Cherry Point*

"The skipper stomped off muttering, 'this is the last straw' . . . "—

"The pilot just left, sir, said he was going to hit the hay . . . "—

"Did the pilot bale out?"—

"Guess he didn't read the notams . . . "—

"*Stalled* out?"—*J. F. Rinehart, NAA, Columbus*

"Little Boy Blew?"—*M. A. Mute, RCN*

"Guess they're putting the F4D out to pasture!"—

"Fill 'er up with 'Hay-P4' "—

"I told him to check the notams"—.

"Dig that crazy external fuel!"—*VA-145 Ready-room*

"Now the duty section, lay down to the ramp for pitching hay!"—

"Baker allotment run out, skipper?"—*J. A. Barton, Vought Aeronautics*

"Something go *hay*wire, sonny?"—*A. F. Ueckert, Jr., Vought Aeronautics*

"Let go, forward!"—*Lt. L. A. Buchalter, VP-834, NAS New York*

"Say again, all after 'ABORT' "—

"Hey, you can't land here!"—

"How many bales does she burn in military climb?"—

"Going slightly below glidepath . . . "—

"Scratched at the clubhouse turn . . . "—*all from ATU-301*

"Git that daggum thing offen my farm, sonny!"—

A special nod to the ASO of ATU-301 (VT-30), who posted the photo with plenty of space for readers to write in their captions, then sent us the whole long list . . . sorry we haven't space to use 'em all.

Several readers questioned the advisability of stacking hay bales so close to where an aircraft might wind up, and pointed out that the hay would really complicate things if a fire were to start. Many thanks to all who sent us captions, and especially to those who included a safety tip.

HEADS UP

Small shrapnel piece from disintegrating chain did this to crash truck windshield (above) — but look at what a much larger piece of the same chain did nearly ¼ mile away! (right)

SAUCERS and airplanes aren't the only things capable of flying. The damage illustrated was done by flying particles of chain—arresting-gear chain. During a high-speed arrestment the chain, which was properly rigged, shattered and sent pieces flying far beyond what you'd consider a "safe observation distance." The concrete building corner, situated about 2500 feet from the point of engagement, was gouged out by a set of links weighing 200 pounds, which then continued on for another 175 feet before coming to rest. The vehicle windshield was struck by a much smaller piece, but serves to illustrate the hazard associated with chain arrestments. The vehicle had pulled onto the runway after the aircraft picked up the chain, and was following it when the shrapnel-like chain fragment struck the windshield.

Corrective measures? We'll continue to have "hot" landings into the chains, and vehicles must continue to be near and ready for rescue, but we can minimize the danger to personnel at least by reducing "spectator exposure" to a minimum. Spectators who are serving no contributory purpose should not be permitted to gather in the open when a high-speed arrestment is imminent. If you must observe, even from a "safe" distance, take at least partial cover behind a vehicle or structure. And if you're in the vulnerable position of the copilot or crewman of a rescue vehicle, duck your head during the chain pay-out. If you're the pilot, you can help by *not* landing with any more speed than you safely need just because the big old chain is there to grab you.

SUDDEN STOPPAGE — The HSS-1 helo was cruising peacefully a thousand feet above the ground when the engine stuttered and stammered for a few seconds then quit. An autorotation was commenced into the last known wind. The area below the sinking helo was relatively flat but happened to be filled with houses.

Some 300 feet above the ground the engine picked up and at this time the pilot thought he would be able to make a partial power landing. However it was simply a brief surge of power which lasted only about five seconds and did nothing except raise the pilot's hopes. This surge was followed by complete engine failure.

The pilot had been aiming for a vacant lot but in the last stages of flight he had to turn 15 to 20 degrees in order to avoid a TV antenna and house. The helo settled to a stop without damage or injury to personnel.

GOOD SHOW — On a mirror carrier landing an A4D made a normal touchdown but the arresting hook broke immediately upon impact with the deck. The pilot, unaware that he had only a useless hook shank hanging from his plane, executed a bolter with the intention of making another pass.

Up in primary fly, the air officer saw the hook failure, ordered the pilot to clean up and immediately shifted him to air operations control for diversion to the beach; a routine procedure except that this was the western Mediterranean with the sun getting low on the horizon. One readyroom philosophy, which may be somewhat facetious but is also somewhat realistic, opines that there *are* no night divert fields in the Med. Thus speed in getting the *Skyhawk* to a dry roost was necessary because of darkness as well as fuel.

Once air ops took charge of the A4D a rendezvous with an airborne A3D was promptly set up. Bearing and distance to the primary divert field was passed to the pair as they were climbing for fuel-conserving altitude. Enroute, a few calls to the tower on the published UHF frequency brought no response from the divert field; but right then it was of not too much concern. However, full scale darkness had set in at ground level and in the fast fading twilight at flight altitude the pilots could see they were firmly on top of a solid undercast.

As the clock crept closer to ETA at the divert field, further calls on UHF failed to make contact with the tower. This plus the cloud deck now complicated matters for the "small boy" as the field had no homing aids usable by the A4D. Any solution now rested on the shoulders of "big brother" in the form of the escorting A3D. The winking position lights of the A4D moved closer to those marking the A3D as though seeking some comfort in the larger bulk.

The remainder of the incident is quickly told: Contact with the tower was finally made by the A3D on VHF. After some message passing the tower agreed to turn on the runway lights and then, as an omni approach was available, the A3D led the A4D down through the soup on an omni penetration. At the lower altitudes the runway lights came into sight. Though only 5300 feet long it was sanctuary and besides, the A4D was a real lightweight at this stage. As the pilot hacked off the power after touchdown the fuel gage read 600 pounds.

Luck or planning? Probably some of both. Prompt and intelligent handling prevented an accident. Supervisory personnel, controllers and pilots alike must be completely prepared at all times to cope with the various unforeseen conditions that may occur in an emergency of this sort.

Truth Or ? ? ?

When the first Grumman WF-1 (the S2F with the big pancake radar on top) was being ferried to the West Coast a control tower operator at El Paso, Texas received a telephone call. "Mister," the caller said with obvious excitement, "A flying saucer has caught one of those Navy planes and is heading across the mountains with it!"

THE BOARD RECOMMENDS—That, regardless of the cause of this HSS accident and without implying a cause, it serves as a reminder to review heavy weather operation of helicopters at seat. Included in such a review should be the following points, many of which are not fully appreciated by young helicopter pilots because they are not likely to be exposed to extreme conditions during the formative period of their training.

a. There is a strong tendency on the part of the helicopter pilot who has not planned his approach to steepen his turn in maneuvering from downwind to upwind in relation to a fixed point.

b. Because his maneuver is more of a reaction to his situation than a deliberate execution of a plan, he tends to be at or near the downwind line from his approach point when his bank is steepest, and normal coordinated relaxation of his turn would result in his having turned too far.

c. To prevent this he abruptly levels his rotor plane and heads upwind, but in doing so he has in effect executed a sideward flare, from which he is not fully prepared to recover.

d. It is at this point that things begin to happen. First the pilot experiences a settling sensation. Because of his low altitude he counters with an increase in collective rather than nosing over. If this is a reaction rather than an anticipated control action, there is a strong possibility of experiencing an RPM drop. The reaction to this is to drop collective and roll on maximum throttle at precisely the time that maximum lift is required to stop the original settling. But if the water is "coming up fast" the pilot cannot afford to wait for the engine to recover his lost RPM and is forced to pull up collective in order to cushion his ditching.

e. The following are the principal preventive measures:

► Plan approaches so that drift is either accepted or partially compensated for by moving the 180-degree point upwind.

► Make turns at a *constant* rate and angle of bank.

► Use a shallower than normal angle of bank to compensate for turbulence.

► Wait until a comfortable upwind position is reached before adjusting for an error in the approach.

► Conduct the approach at an altitude which will allow room for error and a reduction in the effect of turbulence at the surface until in the hovering position."—*from an AAR*

HOT BRAKES—A recent accident involving an F8U-1 was repeated when the airframe caught fire and exploded in a matter of seconds after the pilot ejected successfully. If pilots insist on taking off immediately following an abort, experiencing a dragging brake and/or utilizing heavy braking action while taxiing, it is recommended that the gear be left in the extended position for a reasonable length of time in order that the impact air may cool the overheated wheel. It is further recommended that pilots be continually reminded that this hazard must be treated with extreme caution.—*NASC Analysts*

LOSS OF DEPTH PERCEPTION AFTER SUNSET

"FOR a period of one hour after sunset a pilot can be expected to undergo a serious loss of his ability to perceive the relative depth of objects. If the sky is overcast or if the weather is inclement, this danger period will occur before sunset. Of particular importance is the fact that the decline in depth perception occurs gradually (at first) and continuously. Thus, without special knowledge, the pilot may overestimate his ability to make a landing during the twilight period.

"It is also probably well recognized by all pilots that the ability to perceive landmarks is seriously interfered with after complete darkness has set in. But the rate and amount of loss of this capacity during the twilight interval is probably not so well known.

"The situation with regard to the loss of stereoscopic acuity during twilight may perhaps resemble the circumstances when the oxygen supply is reduced during flight ascent. In the latter case the pilot is adversely affected by the oxygen lack in such a way that he does not notice or feel the need for oxygen. The consequent loss in intellectual function may lead to failure to don the oxygen mask before unconsciousness occurs. In the case of reduced illumination after sunset, the loss of depth perception also occurs gradually and may pass unnoticed. Confidence in the ability to judge the relative distance of objects, as is necessary during landing or while flying in formation, may continue for some time, even though the ability to make such judgment has been seriously reduced. The fact that objects can still be seen, even though their apparent spatial location is uncertain, probably enhances this confidence. It seems important, therefore, to stress the fact that stereoscope ability undergoes an often unrecognized and marked impairment during the twilight period." (From an article by Luis de Florez, for BuAer, "The Relation Between Illumination and Depth Perception and Its Significance for Aircraft Pilots.")

From the AARs

In all of the services, an essential part of each AAR is the pilot's statement, if available. In this statement he must include a statement concerning the cause of the accident and how it might have been avoided. Whenever Safety Officers gather around the milk bar some of these gems always find their way into the conversation. Here are some of the best we have ever heard and a few go back many years. While we cannot vouch for the veracity of them all, some at least we know are true.

● I consider the primary cause of my accident to be supervisory error—my wife kept me up nearly all night.

● This accident would not have happened if I had overslept as I usually do.

● I consider that I would not have had this accident if I had not been led into making a short tight pattern by the WM's sunbathing on the barracks roof.

● This accident could have been avoided if someone had reminded me to put the wheels down.

● I consider the primary cause of this accident to be Design Error. If we can have stall-warning devices in the aircraft why not a too-fast-on-final device?

● This accident could have been avoided if my date last night had not been so obstreperous.

● I feel that weather should be a major factor in this accident—the warm sun made me sleepy.

● The primary cause of this accident is Administrative. I should have never been graduated from flight school.

● I admit that this accident was due to pilot error—but there was nothing wrong with my judgment or technique.

● The sea state was so rough that I was unable to tell the wake from the bow-wave.

● I had been told that the red flags sticking out of the wings were visual fuel quantity markers for the internal wing tanks.

● The only material failure which occurred was me.

● The mid-air collision was the fault of my squadron commander on whose wing I was flying since he did not give the proper signal for the turn.—And I ought to know because last spring I got 4.0 in formation flying in flight school.—*1st MAW "Wingtips"*

THE RIGHT-HAND MAN

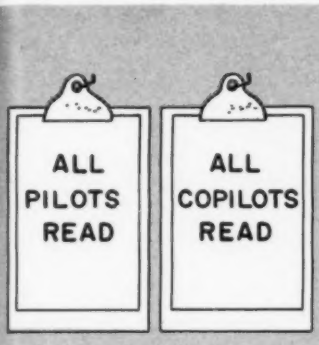
TOO often copilots are reluctant to notify the aircraft command when flight conditions deviate from the normal and an unsafe and dangerous flight condition exists. This may be because the aircraft commander views comments or suggestions from the copilot as a challenge to his authority. When recognizing and calling attention to an unsafe condition, the copilot is only showing natural concern for the longevity of everyone involved. If the aircraft commander is the type who resents any questioning of his procedures he is the wrong man for the job. Is not the copilot capable of recognizing a dangerous flight condition? Certainly he is.

There are two prime reasons for a copilot's reluctance to make suggestions: First, the copilot feels that he is nothing more than a sandbagger along for the ride but not important to the flight, and second, the checkout programs have not placed sufficient emphasis on copilot duties as safety observers during all phases of flight.

There is ample evidence to back up the first reason. The young pilot right out of flight training is assigned to an operational squadron full of enthusiasm. He knows he is going to be assigned copilot duties. He also knows that in the not too distant future he will have acquired the time and experience to qualify as an aircraft commander. He is really motivated; he thinks big and is ready for action. But his sharp edge soon wears off. An insidious attitude begins to permeate his thinking. He gets the feeling that the aircraft commander is the only important man on the crew. The aircraft commander makes all the decisions and gets all the credit. The copilot is merely surplus baggage with little to do except to flick an occasional switch, tune a radio, or keep his eyes peeled for other aircraft.

This type of thinking is deadly. The copilot does not willingly project himself into this frame of mind. To him, he is just being realistic. Psychologically he is barely up to the standards of minimum acceptability for his demanding duties. As a result of not analyzing his job properly, he's coming dangerously close to being just what he thinks he is—useless.

Now for reason number two: Most squadron doctrines are quite adequate for bringing the copilot up to minimum standards. The only problem is that minimums have a habit of becoming



I am a copilot, I sit on the right

I'm not important, just part of the flight.

I never talk back lest I have regrets,

But I have to remember what the pilot forgets.

I make out the flight plan and study the weather,

Pull up the gear and stand by to feather.

Make out the forms and do the reporting,

And fly the old crate when the pilot is courting.

I take the readings, adjust the power,

Handle the flaps, and call the tower.

I tell where we are on the darkest of nights,

And do all the work without any lights.

I call for my pilot and buy him cokes,

I always laugh at his corniest jokes.

And once in a while when his landings are rusty,

I come through with "Jove, but it's gusty."

All in all I'm a general stooge,

I sit on the right of the man I call Scrooge.

I guess you think I'm not understanding,

But maybe someday he'll give me a landing.

Before you, too, begin taking potshots at the man in the left seat please read "Call Me Scrooge," page 33.—Ed.

maximums. Those of us charged with the responsibility for training copilots have a moral obligation to go beyond the minimums and give some good solid instruction on pilot-copilot coordination, particularly coordination in safety. It should be emphasized that when the copilot challenges the aircraft commander on deviations, the copilot is primarily concerned with continued good health for one and all and is not questioning the aircraft commander's ability.

It is not enough that the copilot know all about well established procedures, he must be given the benefit of instruction in the many intangibles of safety which the more experienced heads have learned by experience but which may occasionally slip by them. He must be made aware of his responsibility to be alert for situations that have accident potential. For example, the takeoff and acceleration phase of any flight is loaded with accident potential. Distractions may get the aircraft commander off guard and into trouble, but a prompt warning from an alert copilot can pull him right back out again.

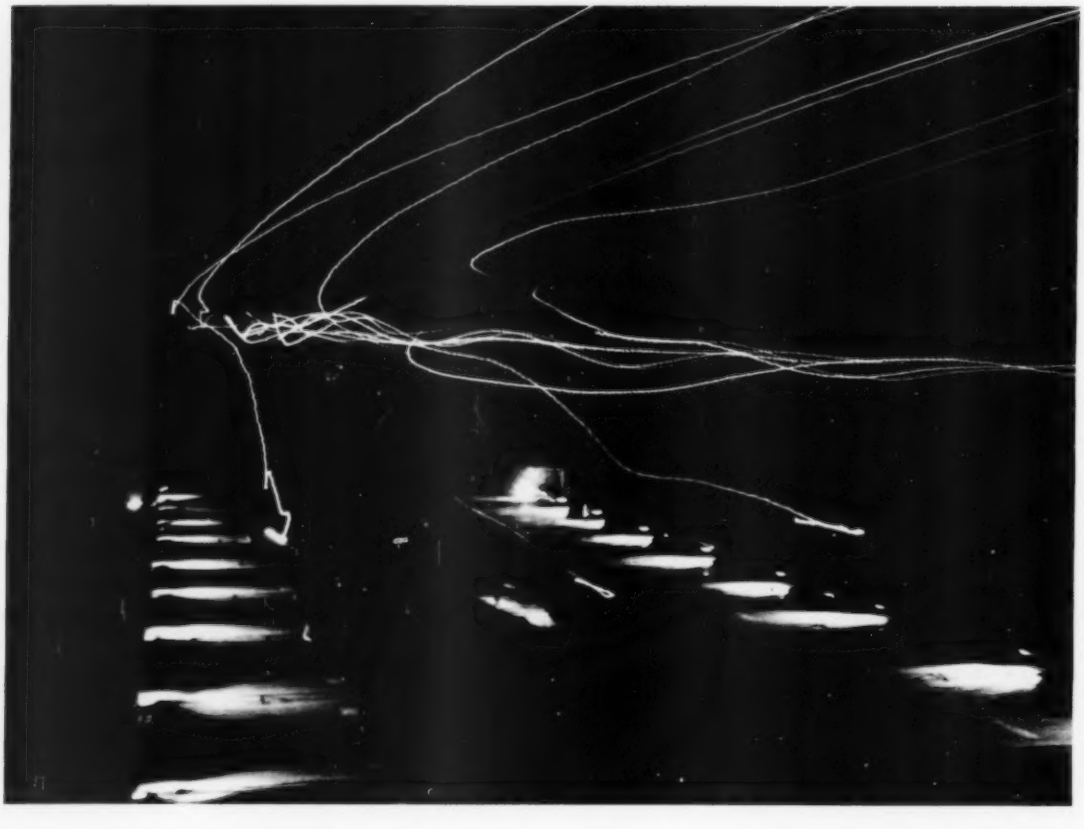
If the copilot will just take a bit of time and analyze the situation he will discover how vitally important he is. He will rediscover that he is not just another man picked indiscriminately from civilian life; he was hand picked. He was carefully trained at great expense. His training was carefully monitored, and had he shown any lack of aptitude for pilot responsibility he would not be where he is. His importance is measured by the cost of an aircraft in dollars and cents; add to this the responsibility for a number of lives. With a bit of analysis of this type, the copilot may find a new respect for his job and himself.

The job of copilot has many responsibilities not cataloged in the books, perhaps the most important of which is accident prevention.

How can the copilot make contributions in this area? Certainly he must make every effort to know the aircraft and current operating procedures. But more than this, a thorough and objective study of his aircraft commander's strong and weak points is desirable. The copilot should monitor the aircraft commander's actions closely and notify him if he is starting to deviate from normal requirements and procedures. Examples are: excessive angles of bank, too low or too high engine and rotor RPM, loss of altitude in the blackness following a night carrier takeoff or failure to make required radio reports. This type of action is typical of an alert and efficient copilot. The influence on the aircraft commander is significant as he will improve his techniques if his copilot is closely monitoring all deviations. Also, the copilot is making a contribution to the safety of the crew of which he will be the aircraft commander at some future date. The good habit patterns and high standards of performance would carry over into his aircraft commander career. A well qualified, mature copilot is one of the best insurance policies a crew can acquire.

The copilot who finds himself slipping into the depths of low self-esteem will do well to do some re-evaluating. He will find much in his job to justify pride, and he will find that he is not just a sandbagger; he is number two in a big business, he is executive vice-president in charge of safety of a very expensive organization. It is a big job. It requires an intelligent, capable, and responsible individual. ●

Reprinted in part from Flight Safety Foundation Inc. Pilots Safety Exchange Bul. 59-110.



PRESERVE YOUR NIGHT VISION

CONSIDERABLE work has been done in the area of night vision. We know that night vision is affected by hypoxia, smoking, age, and exposure to bright lights. In the past we have pointed out that individuals exposed to any altitude above 5000 feet can improve their night vision by taking supplementary oxygen for a short time. This is advocated particularly on landings at night following long flights.

Perhaps another neglected factor in the preservation of night vision is avoidance of exposure to bright sunlight for a prolonged period. I have in mind here an aircrew member who golfs or spends a layover on a beach in bright sunlight and then flys a trip that evening. Individuals should preserve their night vision by wearing dark sunglasses during any recreation which exposes them to bright sunlight or glare within 12 hours of a night flight.

By Dr. G. J. Kidera, UAL Flight Surgeon. (Reprinted from "The Cockpit," Nov., 1959)

notes from your FLIGHT SURGEON

Personal Problems

THE pilot of an FJ-4B lost directional control and swerved off the runway on attempted takeoff. At the time of the accident, the pilot was beset with extremely severe personal problems. His troubles were unknown to any of his fellow officers or his flight surgeon because the squadron had just reformed following deployment.

In his report the flight surgeon states that it is felt that the pilot was not psychologically suited to be flying at the time of the accident because of this stress. This could well have been the contributing factor in causing him to become fixated on getting airborne, the flight surgeon states. This accident, he notes, points out the necessity of the flight surgeon knowing his pilots intimately.

Hook Look

A PILOT on his third hop in an FJ tried a simulated flameout approach at 21,000 feet. The approach was normal until at 6000 feet the aircraft began to vibrate severely. He added power without response, then retarded the throttle with RPM decrease to 46 percent also without effect. He continued the flameout approach and switched to manual fuel control, noticed a loud muffled explosion and then complete loss of power. He tried an airstart without success.

At this point, the pilot advised his chase pilot that he was ejecting. His altitude was 4000 feet. Ejection was normal and separation from the seat was immediate. When the automatic parachute opener failed to function the pilot pulled the manual D-ring and the parachute deployed.

Later, investigators found the automatic parachute opening cable still attached *to the parachute*. If it had been hooked up properly when the pilot strapped in, it would have remained attached to the lap belt after seat separation.

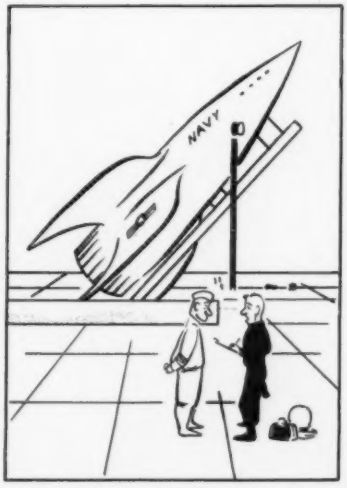
The pilot recalled that he had had difficulty in attaching the ring of the automatic parachute opener *to the lap belt* release mechanism. Actually, he had strapped in without hooking the automatic parachute opener. If he had been unconscious or dazed after ejecting he would have been unable to actuate his parachute manually. If he had ejected at a low altitude he would not have had time to manually actuate the parachute. In either case he would have been killed.

Respectfully Refer

"NAVCAD X did not have his shoulder harness locked. This was not an oversight on his part, as he routinely omits same. He states he relies on the inertia reel for protection. By not locking the shoulder harness, he states he has more maneuverability and hence a larger visual field."

—Flight surgeon in MOR on F9F-5 accident

We refer the NavCad and all other flying personnel to OpNav Instruction 3710.7A which states the requirements for a locked shoulder harness on takeoff and landing.



"Whaddya mean, I only get one day's per diem?"

Locator Aids

AT night, while in the Charlie pattern shortly after a foul deck waveoff, the pilot of an S2F reported rapid loss of oil pressure on the starboard engine and began a single-engine approach. Attempts to feather the engine were unsuccessful. Fire broke out in the starboard nacelle. With continued power failure and inability to maintain altitude, the pilot ditched the aircraft astern and down-wind of the carrier.

All four occupants evacuated the aircraft with only minor injuries. They inflated their Mk-2 life vests and floated for half an hour before being rescued by two destroyers.

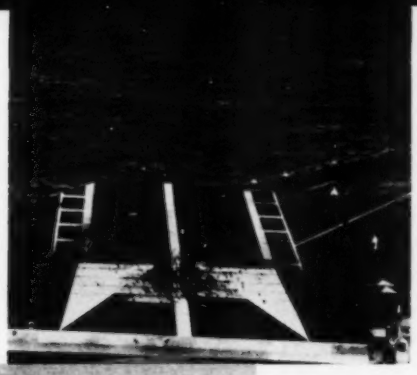
Pilot and copilot wore .38 caliber pistols, loaded with tracers, in shoulder holsters. Personnel aboard the plane guard destroyers stated that the tracer bullets were the most helpful item in locating the survivors. However, they recommend that tracers be fired vertically rather than at an acute angle to make it easier to determine the exact point of origin.

When the destroyers were within a few hundred yards, the survivors began to blow vigorously on their whistles. Destroyer personnel state that they were able to hear the whistles well above the engine, wind and sea noise and were able to "home" right in on the survivors.

Monday morning quarterbacks of the USS INDEPENDENCE got together after an at-sea warmup and came up with some interesting observations and recommendations. Here's the recap of some new and some old • • •

FLIGHT

T DECK ANGLES



THE Aviation Safety Council aboard the USS INDEPENDENCE (CVA-62) included representatives from the following commands: CVG-7, VF-84, VA-72, VA-86, VA-75, ComCarDiv TWO, USS INDEPENDENCE (CVA-62).

The following problem areas were discussed:

Tiller bar steering. Stress the continuing need for tiller bar steering for all A4D crosswind and downwind taxiing. As an aid in handling operations, both A4D squadrons will standardize rigging the nose wheel tiller bar fittings on the same side.

Jet blast. Maintain constant vigilance in aircraft spotting and taxiing to avoid the hazards of jet exhaust blast and heat, and foreign object damage. Aircraft will not be started out of their space until there is deck area available to complete the turn and swing the jet blast into the clear. This turn will be made with the aid of a tiller bar to avoid high power requirements. Aircraft and personnel have repeatedly been penalized with jet blast by an aircraft unable to complete a clearing turn.

Aircraft spotting. Spot aircraft so that the exhaust pipe is accessible. Jets have on occasion been spotted with the tail pipe beyond the flight deck edge, limiting fire fighting and preflighting accessibility.

Alertness of flight deck personnel. Starting units have left an aircraft too soon and are hard to recall. The proper procedure in the event of engine fire is to cut off the throttle but continue windmilling the engine with the start unit. We will restress to all flight deck personnel the absolute requirement for constant alertness and vigilance while on the job.

Flight deck hazards and danger in rushing. Caution all hands about movement on the flight deck and amongst aircraft to avoid blast, propellers, etc. Some men have walked directly in front of ADs with jets turning up ahead of them. To help avoid this danger all aircraft per launch will be manned at the same time, 30 minutes ahead of launch time for normal missions, and 45 minutes ahead of launch for large launches such as air

shows and fly offs. Rushing due to insufficient time allowed has resulted in dangerous practices of improper stowage of gear in the aircraft and poor pre-flighting.

Chock handling. Chock handlers have come very close to seriously injuring personnel by indiscriminate throwing of chocks. Throwing chocks into catwalks will be stopped to prevent injury to unseen personnel and to stop loss of chocks over the side.

Aircraft tiedowns. A few instances of tiedown theft from aircraft have been noted. As measure to stop this malpractice, tiedowns will be painted squadrons' color and severe penalties will be meted out to personnel caught wrongfully taking tiedowns.

Flight filing. To aid in aircraft accounting on flight plans, flights will be filed by lead aircraft bureau number, and ships' call sign and side number of all aircraft. To prevent unnecessary rush, changes in flight plans or refiling for aircraft missing planned launches will be handled by a call to air plot vice actual refiling by the pilot.

Integrity watch. An apparent lack of recognition on the part of some integrity watch officers for the importance of their job has been noted. All integrity watch officers will be briefed on the urgency and importance of their jobs.

Aircraft movement at night. In order to reduce chance of damage to or loss of aircraft, they will not be moved at night while the ship is in a turn. This will require advance notification from the bridge of planned turns.

Smoke in landing approach. Heavy smoke in the landing approach area is a continuing menace and

hazard to landing and line up. Every conceivable prevention and cure measure is being taken to reduce the smoke. In addition, it is planned to work with the wind off more to port in hopes that the critical areas of the approach will be cleared.

Caution—If such action results in a left crosswind, it could cause more accident potential than curves.

Updrafts and downdraft. Updrafts on the approach at about the 300 foot altitude position and downdrafts at the fantail have been noted to exist under conditions of heavy gusty winds. Pilots will be briefed concerning this matter.

IFF. Many aircraft have malfunctioning IFF. A drive has been inaugurated to correct these malfunctions.

Landing alignment. All pilots will be again cautioned about left line-up and landing in a right-to-left drift. Danger exists from reduced deck area for run out, the close proximity of the deck edge, and the existing danger to hook points from deck protrusions.

Clean up and BINGO. Primary Fly and Air Traffic Control will include specific mention of the tail hook in their instructions to pilots bingoing in order to help prevent an inadvertent tail hook down landing at the beach. Also Air Operations and all pilots were reminded to take into account any adverse strong winds when calculating the bingo fuel.

Safety Consciousness. All units were directed to stress safety consciousness to their men and to assist whenever possible in the indoctrination of Marine Units aboard for the next operation in safe air operation practices. All personnel were requested to bring to the attention of proper authority any unsafe practices noted in air operations aboard INDEPENDENCE. ●

The Heat is On!

IT IS A well-known fact that compressor stalls lead to turbine failures.

This gives us two areas to study—the stall and the turbine failure. Exactly what happens during a compressor stall has been the subject of a controversy for years. Working as a pump the compressor delivers air at a relatively constant rate, at a given RPM and inlet condition, regardless of the outlet pressure. If the compressor outlet is restricted too much, the pressure rises to a point that stall occurs on the compressor blades. This happens in much the same manner as in an aircraft wing stall.

In normal operation the compressor blade meets the air at an angle of attack which allows smooth flow. However, as the back pressure on the compressor increases, the air velocity through the compressor is reduced. Stall occurs when air velocity, because of compression, is reduced to where the blade reaches a critical angle of attack. Just as an aircraft wing loses lift in a stall, the blade loses its ability to push air back to the next stage.

One of the obvious answers is to operate at a lower pressure across the compressor. If this is done, however, there would be a substantial decrease in thrust and efficiency.

Instead of sacrificing engine performance, various means of fuel control have been developed in an effort to overcome the problem during acceleration. As the addition of fuel to accelerate raises the pressure across the compressor, careful fuel control is necessary. However, despite sensitive fuel control, stall may occur because of the small stall margin available at some engine speeds.

Stalls frequently happen where extensive throttle jockeying is required, such as during air refueling; and while there is no specific RPM at which the compressor will stall, it usually is in the range of 62-72 percent. Severe stalls are characterized by low engine RPM and excessive EGT readings. And here is where the pilot should be on the alert. In multi-jet aircraft comparison of other engine tachometers will verify the engine RPM and a check of the EGT by the pilot will confirm the stall.

In the case of a mild or "cold" stall, a more insidious condition exists. A drop-off of RPM, or RPM hang-up, without any appreciable rise in EGT may be experienced. In this condition only the aft stages of the compressor are stalled, interrupting the cooling air to the wheel. This too can result in serious trouble. The only difference is that it sometimes takes longer to show up.

The crux of the problem, then, is overheated turbine wheels. Strange as it may seem, turbine wheels have a sort of a built-in memory. Due to the characteristics of the metals used in the wheels, each overtemperature condition is impressed into the memory of that wheel in the form of changes in the structure and grain sizes. These changes are cumulative and result in a reduction of the tensile strength of the material. Each time the metal is overheated, the grain size grows larger and the structural composition of the wheel changes. Because of this progressive weakening, the wheel becomes a time bomb, ready to explode and trap an unsuspecting crew. Unfortunately a casual inspection will reveal nothing; the change can be detected only by microscopic examination.

Refueling is most frequently conducted during a descent; and this type of refueling results in a wider range of throttle manipulation than required in level flight. With this throttle jockeying there is a greater probability of a compressor stall.

Further, while refueling in a descent, position often can be maintained with an engine stalled and the stall remain undetected for a considerable time. If the engine does not fail this time, damage to the wheel will very likely cause it to fail later.

If you have a stall and are lucky enough to avoid immediate engine failure, be certain you write it up in the yellow sheet. This will insure that proper inspection is made of the wheel and that necessary corrective action is taken.

Each pilot and maintenance man must follow the published procedures. Here are a few tips that might help:

—Use extreme care in throttle movements. A disconnect in refueling is better than an engine explosion.

—Keep a close eye on the gages and detect stalls early.

—Write up all stalls and overtemperature conditions in the yellow sheet.

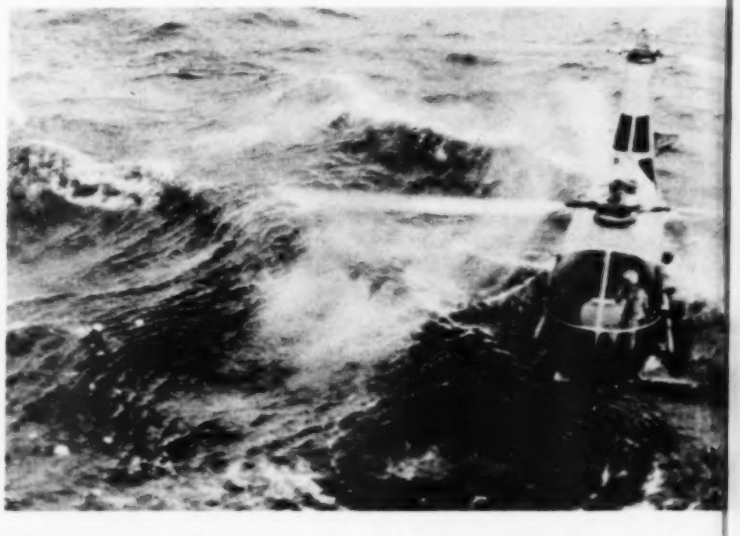
—Watch your EGTs on starts. The higher the temperature the more probability there is of damage.

—Make sure the engines are conditioned in accordance with approved practices.

—Examine intakes and tail cones for damage and foreign objects.

Based on material written by O. H. Douglas, Boeing Airplane Co. for USAF "COMBAT CREW."

UNDERWATER



THE F8U was launched from the port catapult promptly at 0730, but the bridle parted a short distance down the deck. The plane went off the port bow and struck the water in a 70-degree nose-down attitude. It sank up to the tail structure, came back up and flipped over on its back. Ten to fifteen seconds later it sank again.

Thanks to his properly fitted torso harness, protective gear and locked restraint harness, the pilot withstood the impact well. Water rushed in and filled the cockpit. Immediately the pilot reached for the face curtain. He found the handle out of its socket and hanging behind his head. He pulled the curtain overhead and down but it stopped short of firing distance. He reached above his head and felt no plexiglas (possibly the impact and water pressure removed the canopy).

"When nothing happened, I released the curtain and felt around," he recalls. "My groping hands found the windshield bow. I immediately pulled the ditching handle and left the cockpit using the technique taught in the Dilbert Dunker."

During this time underwater, he continued to breathe through his oxygen mask using his bail-out oxygen supply; at no time did he get water in his mouth or nose.

Just after escaping from the cockpit, he attempted to inflate his life vest but was unable to (probably because he was pulling something other than the life vest toggles, the accident board theorized). He surfaced 30 feet from the ship.

"When I reached the surface, I saw the side of the ship racing past me," he states. "Then I went back under. When I surfaced again I was facing aft and the white foaming wake was bearing down on me. I was again submerged, and as I came up the third time, I saw the helicopter.

The pilot remained afloat by swimming. As the helicopter came over him, he got out of his parachute and pararaft pack, unplugged his oxygen hose from the pararaft bottle and released one side of the Hardman fitting on his oxygen mask. Fatigue slowed removal of the chute and pararaft. He had been in the water 10 minutes. By now he had pulled one life vest toggle which partially inflated the vest.

The helicopter rescue of the pilot leaves much room for improvement. Due to inexperience, the helicopter crewman did not lower the rescue sling far enough into the water. This plus the pilot's fatigue prevented his entering the sling. He fastened one of the straps on the sling to the left shoulder ring of his torso harness. When he was lifted to the helicopter, he hung two feet below the fully raised sling. The helicopter crewman lowered the pilot again to see if he could get into the sling in the water but the pilot was too fatigued. The crewman then raised the pilot again and the helicopter carried him to the plane guard destroyer and lowered him to the fantail.

The pilot suffered only a few minor lacerations and bruises in the accident. He did not have his helmet visor down when the F8U crashed into the water and consequently sustained a slight hemorrhage of one eye from the water pressure.

Survival training enabled the pilot to analyze the situation and take proper action quickly, the reporting flight surgeon states. The pilot had received Dilbert Dunker training at NAS Pensacola and at the FAETUPac Survival School in San Diego. He had also had ejection seat training and frequent emergency procedure training in the F8U model Link Trainer. Wearing the oxygen mask and connecting the emergency oxygen supply played an important role in the pilot's survival, the flight surgeon concludes.—*From an MOR*

ESCAPE

ON RARE occasions a pilot is faced with entering the water in the cockpit of his airplane. This discussion is intended to present the facts associated with underwater escape and is not necessarily intended to present any conclusions.

The F8U airplane is equipped with a ¼-inch thick cast acrylic (Plexiglas 55) canopy which is stressed for normal cockpit pressurization of 5.35 psi positive and 0.25 psi negative pressures and air loads within the flight envelope of the airplane. When placed in the unusual submarine environment, these normal loads no longer apply.

In tests, it has been determined that the cartridge-actuated canopy remover will not lift the canopy when submerged deeper than about 2 feet in water, and that the canopy will fail inward (implode) at depths of about 15 feet in sea water if the cockpit is sealed.

It was also determined in tests that modern sweptwing jets sink at a rate of about 8 feet per second after all forward motion has ceased, and that they sink in a tail first attitude. From this it becomes obvious that in order to remove the canopy from the *Crusader* under water, it must either be done before the airplane sinks below a 2-foot depth or there must be a leak which equalizes the pressure inside the cockpit to within about 0.9 psi (equivalent of 2 feet of sea water) of that on the outside.

There is no information available as to the hazard of an implosion with the accompanying sudden compression (almost 1000 psi), but one may draw his own conclusion on this. There have been many opinions expressed concerning underwater ejection. As for the forces which act upon the body, all are within tolerable limits. However, to accomplish a successful ejection under water, the choice is to either go through the canopy, or be certain the canopy is removed before entering the water.

The normal ejection sequence is doubtful when under water. To begin with, there must be a water pressure differential of less than 0.9 psi in order to lift the canopy. The resistance to travel which the water imposes will probably not permit the canopy to open far enough to shear the pivots and arm the seat catapult. Subsequent ejection would require pulling the override and firing the seat into a canopy which could be only partially open.

Ejection through the canopy must be accomplished by first pulling the canopy override. If the face curtain is pulled first, it is possible that the cartridge in the canopy actuator may be fired and the pressure contained due to the water head on the canopy. The latches will be unlocked and subsequent attempted ejection through the canopy will result in breaking the Plexiglas, equalizing the pressure, and allowing the canopy to rise, resulting in collision with a partially open canopy.

Any underwater ejection compromises the escape because the pilot's harness is released from the seat automatically, but he is still attached by the parachute automatic arming cable. A force of about 20 pounds is required to separate the pilot from the seat by pulling the arming cable. This separating force is probably not available from the buoyancy present under water. Therefore, the pilot will be forced to push the seat away. This action will arm the parachute, immediately (in 0.75 seconds) deploying the parachute under water, adding to the pilot's problem of escape.

The other alternative would be to pull the ditching handle before ejection. This would seem ill advised, however, because it is likely that the pilot will get out of favorable position for ejection due to unusual attitude or possible buoyancy in a partially filled cockpit.

All of the foregoing leads up to the preferred method for escaping under water.

► *Get the canopy off when it is first apparent that the airplane may go into the water.*

► *When in the water, pull the ditching handle and climb out.*

► *Do not remove the oxygen mask. The bailout oxygen is automatically actuated on egress from the cockpit and will provide for breathing until the flotation gear is inflated and the surface is reached.*

A note of caution is in order for ascent to the surface from very great depths. Severe, if not fatal, injury can be inflicted to the lungs by surfacing from about 100 feet while holding the breath. Always exhale slowly during the ascent, attempting to have all air exhausted from the lungs by the time the surface is reached.

A pilot with inflated flotation gear will bob to the surface at the rate of about 15 feet per second, so the exhaling need not be done too slowly. Good estimates have been made of the depth from which a pilot can survive. This runs from 170 to 300 feet, depending on the pilot's physical condition, and on how well he accomplishes the exhaling operation during the ascent.

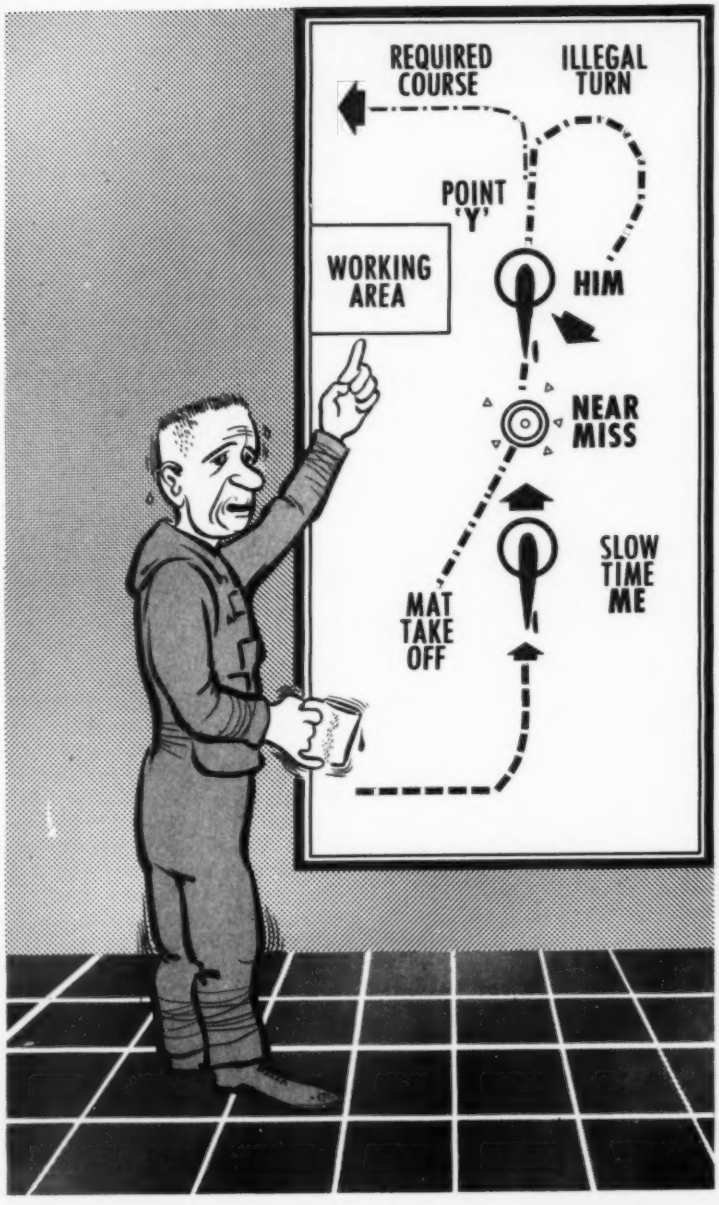
Chance Vought
"Flight Safety Bulletin"

PATTERN PATTER

WHILE I was putting slow time on a helicopter I observed another helicopter takeoff from the mat after obtaining radio clearance from the tower. I was at 750 feet in the slow time pattern. By the time I was abeam his takeoff point he was ahead and a little lower than me.

When he arrived at point "Yankee," which requires a 90-degree port turn he called the tower twice for a spot assignment to practice low altitude work. There was no answer from the tower and after passing point "Yankee" he started a starboard orbit (strictly against field course rules) and commenced climbing to 750 feet. The result was what looked to me like a collision course and called for a descent and radical turn on my part to avoid "the ruination of my whole day."

He then turned right and flew over the working mat area where several helicopters were practicing at 500 feet and commenced a descent to 500 feet. Finally he got the tower to clear him for a spot and started his scheduled training. I got some training that morning too—the unscheduled type which I can do without.



The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in ready-rooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

IN THE DARK

IT WAS a CAVU moonlit night in the early spring but the FJ pilot brought it in wheels-up. Having just finished changing out of flight clothes I was getting into my car which was parked near the runway. Just then a large truck pulled up alongside me and the driver called me calmly "Have you seen a wrecked airplane?"

I answered "negative."

"Well then," the driver said, "I've been all over with this foam and can't find the wreck—Guess I'll go back to the firehouse."

With that he slowly drove off. Luckily, I found out later, there had been little damage to the aircraft and no fire.

FOR GRANTED

I WAS assigned an SNB for a proficiency instrument cross-country to a western Air Force base. My copilot was young and the kind of a person it is good to have around for fun or emergency. We had an uneventful trip (mostly simulated instruments) and finished up the hop well after dark. Since snow was forecast I requested the airplane be hangared.

Departure time was shortly after breakfast. There had been no snow and the airplane was parked on the line in the brilliant sunshine of a cloudless, western morning. Nothing seemed wrong except that one battery was apparently dead. The home base maintenance had been a little fuzzy and I decided the battery was part of the fuzz. It would probably take an electrical charge during the rather long return trip so I squawked it in the log and we took off.

With the gear up, the *Beechcraft* worked up to climb speed but at 95 knots a pronounced vibration in the tail was felt. The left wing became quite heavy.

Hasty investigation showed that the left battery cover, on the top of the wing near the cockpit window, had come open. It made a dandy spoiler and the turbulence it created threatened to remove the tail above 95 knots. As I was in a reasonable position to turn downwind for a right-hand approach I called the tower and got clearance, declaring a potential emergency situation with a brief description of the situation.

On downwind I got enough altitude to feel out the flap performance and it flew well enough at speeds I would need so I continued the approach; rather a poor approach it was too.

I ended up angling in the groove, low, close in, but rather than take a waveoff in a doubtful airplane, I turned more steeply into the runway and watched daisies come up to meet the right wingtip. The landing was good enough to walk away from and the airplane wasn't hurt—only my pride.

We found out too late that before hangaring an airplane, it was base policy to disconnect the battery. No entry had been made anywhere to show that it had been done. The mechanic had shut the battery cover, pushed it into place but had not fastened the Dzus buttons. Of course he hadn't done the job completely as one battery was still connected. That's what led me into the booby trap. I saw and felt no discrepancy in the state of the battery cover and made the mistake of assuming what I didn't know — that the battery was discharged.

Probably the most important lesson in this tale is that . . . it is unwise to take anything for granted. Since then I have been made maintenance officer and I require my people to log all actions, even if only a red tag in a stranger's cockpit.

TUNE UP

DURING a local pilot check flight in a WV-2, the radioman was told that the pilot in the left seat would go hooded and for him, the radioman, to keep a vigilant watch for aircraft appearing on the port side. Any sightings were to go to the check pilot over the ICS.

Shortly after the "watch" was instructed and posted, he saw an aircraft rapidly approaching at the same altitude from the port side. He called the pilot over the intercom several times with no evidence of contact. The approaching plane continued on the same closing course. The radioman, still vainly trying to contact the pilot, suddenly received a loud blast over the ICS of "What did you say, Radio?" He replied, "Sir, an aircraft just passed from port to starboard less than 200 feet below us!" The reply from the cockpit was along the line of "oh."

The cause was traced to the

use of the volume controls. The ICS volume control was being used to lower the output of the UHF receiver. Both systems are tied into the same junction box, however, the UHF has its own volume control located on the UHF control panel. Therefore the ICS was rendered almost useless to anyone calling the flight deck.

The remedy is to insure that pilots are aware of the fact that UHF volume need not and should not be controlled by the ICS volume control.

CHOKED UP

A MALFUNCTIONING carburetor led to the discovery of a dessicant bag resting on the top of the carburetor screen in a UF-2. This aircraft had been flown to the West Coast from the manufacturer's overhaul plant on the East Coast, was surface shipped to Hawaii, and was "trans-pac" to a mid-Pacific base, prior to the discovery of the bag.

GUESSTIMATE

I WAS section leader of two FJ-4Bs on a cross-country to Lowry Air Force Base in Denver. Getting there was no problem. We were to meet another section at Denver and then all of us would go on to Yuma as a division. I was also scheduled to lead that portion of the hop.

We met at Denver in the early afternoon and had a fairly thorough briefing. I filed the DD175 and asked the airdrome officer if section takeoffs were permitted. He replied that they preferred a 10-second interval. I gave him a "wilco" on this. He also pointed out that my DD175 was incomplete as I had not computed my takeoff roll.

My nomogram for takeoff roll was in the airplane. The rest of the pilots had left theirs in the planes too. We huddled and took a few wild guesses and came up with 6000 feet—no sweat with the runway available (8300 feet of concrete). We even took the altitude (5400 feet) and temperature (70 degrees F.) into consideration.

Start and taxi was uneventful and I took the runway at the very end. Clearance to roll came through and upon releasing brakes I was told the wind was calm. Still no sweat. After about 1000 feet of roll I was told I had a six-knot tailwind. Still no sweat if I could get 100 knots by the time there was 3500 feet remaining.

About the time I rolled by the 2000-foot marker the tower advised me of an eight-knot tailwind—Sweat! Too late now to start new computations to see if I can make it off the deck. I felt I could so I didn't abort, but there was enough doubt about breaking ground to make this part of the ride uncomfortable.

Woosh! I just barely cleared the barricade and the two fences past the end of the runway. My wingman had it no better but we were airborne and on our way home. There was quite a pucker factor all the way home and I am now (along with three others) a firm believer in knowing what the takeoff roll is *before* I roll, including how much tailwind, uphill grade, etc., I can accept and still get off without using adrenalin.

BELTED ABOUT

THE hop was a scheduled solo cross-country in an F9F-8T. Weather briefing was for 3000′ overcast with tops at 6000′ and a second layer at 24,000′, broken to overcast, tops of buildups 35,000′. Thunderstorms were reported in the area with a possibility of hail in the thunderstorms.

Takeoff was normal and I went into the soup at 2000′. I was cleared for a clockwise arc at the 30 NM fix, still IFR but with only moderate turbulence. Approach Control contacted me as I was nearing the 150-degree radial and requested my altitude. I reported 26,000′ and was then instructed to continue climbing to the holding pattern to a maximum of 35,000′ until further advised. At this time several bolts of lightning flashed very close by.

Suddenly the airspeed, which had been indicating 280 knots with pilot heat ON, started decreasing rapidly. A cross-check of my instruments showed attitude gyro indicating a climbing attitude, VSI read 500 fpm up, and the turn and bank indicator read wings level. Forward motion on the stick had no effect on the aircraft. Severe turbulence then threw the aircraft into several unusual attitudes and out of control. I had difficulty watching the instruments or charts, navigation bag, survival knife, and a lot of dirt began flying around the cockpit because of alternating position and negative Gs.

There was a lot of noise from hail and the airspeed read ZERO. With my left hand I felt the reassuring ejection face curtain. I had to read the 10,000′ needle on the altimeter as the other hands were moving up and down too rapidly. I decided to eject if I did not have control at 10,000′.

As quickly as I had lost control, I regained it at 16,000′ in an inverted 60-degree nose-down attitude. I rolled the aircraft upright and recovered at 10,000′ with airspeed at 320 knots. As I had experienced enough thrills for the day I contacted Approach Control and gave my position as 28 NM on the 170-degree radial and requested a straight in approach back to home field on the

150-degree radial. This was approved and I broke out at 1500' at the seven-mile gate. Upon landing the accelerometer read +5 and —1½.

SEA STORY

WE DEPARTED Navy Bermuda at 1500 in a P5M-2 for Norfolk. The forecast for ETA at Navy Norfolk was 8000 feet, three miles. Since we had already flown 11 hours that day, we were eager to get home.

At 1930 we crossed the North Carolina coast, and the forecast appeared to be accurate. Elizabeth City was reporting a 5000-foot ceiling, and Norfolk radar took us for a vector to the ASR pick-up point. After 15 minutes holding, we began an ASR approach to the seadrome. A reported 300-foot ceiling, one-half mile visibility came as a surprise. While climbing out from our second missed approach, ASR reported that due to a malfunction the seadrome lighting had become extinguished. No problem. We cancelled instruments, and advised we were proceeding Elizabeth City Coast Guard, VFR.

Upon gaining contact with Coast Guard tower, we were informed the seadrome would be lighted; but, the weather that had been 5000 plus an hour earlier was now 200 feet, one-quarter mile in fog. Also, the instrument approach had been cancelled 28 days earlier by FAA. Our state was three hours; Norfolk Center obtained clearance for an ADF approach, pilot's discretion.

We failed to break out on two approaches. Back on top, we checked the weather at various East Coast seadromes. Patuxent River was still open, and advised they could take us if we arrived within the hour. Enroute however, Pax suddenly reported 100 feet, one-sixteenth of a mile and advised they "didn't want any part" of us. Every seadrome within our range was IFR.

I reported to the Center we would return and set up an instrument approach to spacious Albemarle Sound using our own radar. Before we could commence, the Center told us that our CO had been notified of our plight; and the boys back at the squadron had worked out an approach for us. We decided to try it out.

Crossing the Elizabeth City range on a heading of 134 degrees, we slowed to 95 knots and began a descent to 100 feet. At 200 feet we broke out and continued down to 100 feet. After being outbound for three minutes, we began dropping a series of Mk-6 smoke lights, each one at a five-second interval. By executing a 90-270 degree turn, we were set up on our do-it-yourself sealane. After one low pass, we landed safely.

It is interesting to note that 15 minutes after landing conditions became zero-zero, and the boat sent out to us became lost in the fog also.

"Call Me Scrooge"

I am a guy
Who flies in the sky
With a man on my right, all the time.

For I fly with cargo
From here to Key Largo
To save the Navy a dime.

Now this boy on my right
Who holds the flashlight
As I shoot an approach to a flare,

Is a guy who's a must
With a terrible lust
To fly from the left-handed chair.

He thinks he's a stooge
And he calls me scrooge
Real un-understanding is he.

But if he takes the wheel
And louses the deal
For "No Supervision," they'll hang me.

See pages 20, 21.

DOUBLE TROUBLE

HAVING just picked up a plane full of passengers at a West Coast air station we were cleared to taxi and runup between the dual duty runways. The dual runways might have had some bearing on the confusion which followed but it could happen at any runway.

After our runup the tower told us to take the right dual runway, cleared for takeoff. I was copilot and the approach end of the runway was to my right. The pilot asked for a final check of our takeoff checklist and my attention was diverted from watching outside. As we approached the duty, a scant 20 yards away, the blast of a jet (which later turned out to be making GCAs and was under full control at the time) roared uncomfortably close across our nose.

The lights on the jet were apparently out, except for a starboard wing light, and the tower had not seen him or evidently not been told by GCA that he was on final to a touch-and-go. Coordination between GCA and tower is an exacting one I realize, but the crowning statement came when the tower gave us a belated "hold" and cleared the jet for touch-and-go, also advising him his nav lights weren't visible.

In the future one of the oldest flying rules in the book will be reemphasized in my procedures —"always look carefully for approaching aircraft *before* you take the runway."

Have a problem, or a question?

Send it to

headmouse

he'll do his best to help.

Classification

Dear Headmouse,

A pilot is on a test hop in a twin-engine aircraft. He cannot unfeather the no. 1 propeller. While over the field he discovers a severe oil leak in no. 2 engine and makes an immediate landing. When he has the runway made he feathers the no. 2 propeller just prior to landing.

Is this incident a Flight Hazard within the purview of paragraph 8.f. Section A of OpNavInst P-3750-6d or a non reportable precautionary landing as stated in parenthesis of the same paragraph?

THOROUGHLY CONFUSED MOUSE

► This is reported as a Flight Hazard — OpNavInst 3750.6D, para 8f. As soon as you felt it necessary to feather the No. 2 engine you placed yourself in the position of not being able to maintain altitude and consequently made a forced landing.

Very resp'y,
HEADMOUSE

Tail Wheel Tale

Dear Headmouse:

R4D tail wheel BPD 52058 Stock No. RH1630-256-9042-X exploded while being inflated in shop. Four bolts which hold rims together stripped nuts and cotter pins causing rims to part. These bolts are ¼"-28 with castle nuts and appear to be used over and over again. Tire was not over inflated and gage, which was used during inflation, was found to be accurate.

Recommend that alternate wheel 204-A-204M 1 Stock No. R-1630-248-1515 X 110, which has five ¼"-24 bolts with elastic stop nuts be used in place of BPD 52058. Latter rim appears much stronger and should be made primary and not alternate item. Request you investigate and publish findings.

ANYMOUSE

► There are no previous occurrences on record at NASC. FUR usage data for the previous 10 months shows one wheel BPD 52058 was removed—reason unknown.

The alternate wheel specified is one of several listed as interchangeable wheels.

In view of satisfactory service and reliability of present primary wheel, the recommendation that alternate 204-A-204M be designated as the primary wheel is not considered justified.

Causes of this failure can be narrowed down to the following:

a. Use of excessive air pressure and/or high pressure outlet. This is discounted in your letter; however, the type of failure suggests this possibility.

b. Improper wheel-tire buildup. This includes such possibilities as failure to properly torque nuts, but most probably use of worn or defective nuts and bolts.

c. Inadequate supervision and inspection.

The necessity for increased care and strict compliance with published instructions in wheel buildup is well known at NASC. Recent investigations concerning wheel bolt failures in F8U aircraft have revealed that improvements in wheel tire buildup procedures and practices and proper supervision and inspection are mandatory in order to reduce the number of wheel failures.

Very resp'y,
HEADMOUSE

Why Pomola?

Dear Headmouse:

My subject is the POMOLA and the Optical Landing System ashore.

1. Why was the system originally introduced?

2. Is it as valuable on land as aboard ship?

3. Do you believe it requires special flying periods for indoctrination?

4. Do you recommend its use for pilots on their fam flights in a new bird?

5. Do you feel it should be used on all flights?

ANYMOUSE

► At the present time two optical landing aids are employed ashore by the Navy and Marine Corps: (a) the mirror, which gives an identical presentation to the one installed aboard ship and (b) POMOLA (Poor Man's Optical Landing Aid), which inexpensively provides a visual glide slope. Now to answer your questions each in turn:

1. The mirror was first installed at selected air stations (actually the mirror was portable) to train carrier pilots in the proper use of the informa-

tion it provided. Being expensive there were a limited number of mirrors available. To supplement the mirror POMOLA (see APPROACH for April 1958 page 5) was devised for use by those stations not equipped with mirrors.

2. While an optical landing aid is not as necessary ashore as aboard ship, we believe it is just as valuable since its proper use insures a normal (not hard, not greased) touchdown in the touchdown area. Proper use of the aid (mirror or POMOLA) will insure no more undershoots, overruns and hard landings and save additional money since 14,000 ft runways really aren't needed.

3. The big problem is in education. It is hard to convince a successful, accident-free pilot that there is a better way. It has been our experience that many pilots object to using the aid because they "land too far down the runway." However, further investigation revealed that these pilots were a little fast (5 kts.) so that the aircraft floated once it got into ground effect. It should be noted that new pilots—or those new to mirror or Pomola—should not use the aids without indoctrination. In the use of the mirror at least flight one period under the supervision of an LSO or experienced pilot with two way communication on the runway is desirable.

4. Yes. Experience has proven that the optical landing aid makes the first landing far simpler than it used to be. If the procedure recommended in "Final Approach" is used, landing will become simple, easy and safe.

5. Emphatically yes. Since it does aid the pilot in establishing himself on the proper glide path, the pilot has one less variable to worry about.

Another pilot objection that has arisen recently is that the optical glide slope is too steep. Actually this is not so because the shore-based optical glide slope is 2.5° as compared with the usual GCA glide slope of 2.75°. And there have been no complaints about GCA being too steep.

Very resp'y,
HEADMOUSE

Effect of Engine Hose-Down

Dear Headmouse:

This activity operates three UF-1 aircraft primarily from seadromes. Corrosion is a constant problem that is combated through fresh water hose-downs. The hose-down takes place after the aircraft is chocked and engines secured. The entire surface is hosed first with the engines (Curtis Wright 1820–76A) washed down last in order to receive maximum cooling of engines before hosing.

Recently the No. 7 exhaust stack (Stock No. R1560–037–1494–AGRA) lost a 2½" by 4" piece of stack during flight on the starboard engine. Time of this engine since overhaul was 445 hours. The aircraft returned to base without incident however engine section metal repairs required several days.

Use of the above hose-down procedure of aircraft engines was approved by the local engine manufacturer's representative prior to adoption by this activity. It was generally agreed that the engines received similar effects without consequences during flight when the aircraft is flying through heavy rain conditions.

Station pilot inquiries have been received as to fresh water hose-down of the engines possibly contributing to the defective exhaust stack referred to herein, or other adverse effects. Therefore, any reference of existing standing operating procedures and/or comment on the subject would be appreciated.

C. C. WITKOWSKI
Maintenance Officer

Oppama, Japan

► Ref: (a) Handbook, Preservation of Naval Aircraft NavWeps 15-01-500 revised 15 Dec. 1959.

(b) Handbook, Aircraft Maintenance Cleaning NavAer 01-1A-506.

(c) P5M-2 Handbook of Maintenance Instructions AN 01-35-35EJB-2.

References (a), (b) and (c) contain instructions for the prevention of corrosion in aircraft. These instructions include the washing of the entire aircraft with fresh water immediately after beaching. Local commands operating seaplanes utilize the fresh water wash down for the entire aircraft including the engines as standard operating procedures and encounter no adverse effects to the engine or engine components. Years of experience in seaplane operations by the Navy has proven the fresh water wash down to be a valuable corrosion combating agent for the entire aircraft with no ill effects to the aircraft or engines when adherence to existing instructions is maintained.

It is concluded that: The fresh water wash down should be used on the entire aircraft in accordance with references (a) and (b) for maximum benefits.

The cooling effect from the application of water is not considered of sufficient magnitude to result in engine or engine component damage.

References (a) and (b) emphasize the proper use of the wash down in respect to control surfaces, lubrication points, actuating cylinders and to preclude introduction of water into the engine.

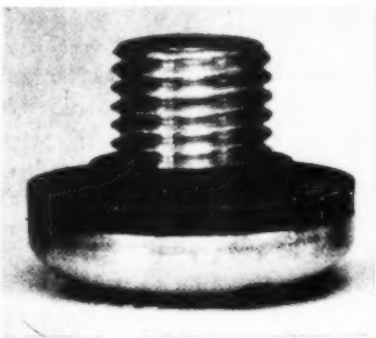
Your wash down procedures appear to comply with the requirements of references (a) and (b).

It is therefore recommended that you continue with the corrosion prevention program ensuring strict compliance with the procedures set forth in references (a) and (b).

Very resp'y,
HEADMOUSE

After takeoff with hot wheels gear should be left down 45 to 60 seconds to prevent any further rise in wheel temperature.

Wheel Overheating Problems and Landing Gear Wheel Fusible Plugs



THE Service Test Division of the Naval Air Test Center has conducted an evaluation of landing gear wheel fusible plugs designed to prevent explosive failure of the wheel/tire in the F8U. The wheel overheating information obtained during the prosecution of the project is applicable to all aircraft that have wheel overheating problems (F4H, F3H, FJ-4B, etc). The tests were conducted at runway temperatures between 80° and 85° Fahrenheit (F). The purpose of this bulletin is to publish the circumstances which produce critical wheel heating problems and provide guide lines for the best procedures to alleviate the possibility of explosive wheel failure from overheating.

Time-temperature histories indicate that normal taxi using nose gear steering, Military and afterburner takeoffs, MFCLP and touch-and-go landings do not significantly increase wheel temperature. The serious wheel overheating problems arise after an aborted takeoff, or from stopping after a normal landing. Those aircraft that use differential braking for turning will develop more heat during taxi. A dragging brake will also produce excessive heat at the wheel; and in each case of dragging brakes, the amount of heat produced will vary. A badly dragging brake could raise wheel temperatures to a point where a normal takeoff would heat the wheel enough to produce explosive failure.

Whenever the brakes have to absorb considerable energy, as in an aborted takeoff or normal landing, maximum transfer of heat from the brake discs to the wheel usually takes 15 to 20 minutes. For this reason, the tire/wheel usually fails after returning to the line or during a climbout if the airplane took off after the abort. Records show that wheel temperatures are increased 170° to 175° as a result of aborted takeoffs. Normal landings increase wheel temperatures 130° to 150° above the wheel temperature existing just prior to landing. The wheels require 45 to 60 minutes to dissipate 60% of the heat absorbed in a landing rollout or aborted takeoff. The critical wheel temperature and tire pressure for explosive failure is somewhat different for each wheel. The F8U wheels, with the tires serviced at 250 psi, become critical at around 400°F. The fusible plugs evaluated during this project in an F8U airplane were set to fuse at 350°F. When the wheel reached 350°F, the plugs fused and deflated the tire. However, until such time as the fusible plug evaluation is completed and a Service Change is issued to incorporate fusible plugs in landing gear wheels, critical heat build-up must be prevented by proper operating procedures.

When an airplane returns to the line with hot wheels, the airplane should be left in a clear area for a period of 30-40 minutes to allow ample time for the wheels to pass the critical heating phase. BuAer Instruction 13420.1 of 17 November 1959, details cooling procedures which can be used.

The most critical situation arises when a pilot takes off with hot wheels. Whether a previously aborted takeoff or a dragging brake produced the heat, the critical circumstances for an in-flight explosive failure are present. Under these conditions, the landing gear should be left extended 45-60 seconds after takeoff. This cooling period should be accurately timed with the sweep second hand of a clock—*not* left to guesswork. Although this time period will not dissipate all the heat, it will establish a cooling trend and prevent any further rise in wheel temperature. Of course, leaving the landing gear extended for longer periods of time will lessen the chances of wheel/tire failure.

While these procedures may not be the final answer for runway temperatures over 100°F., the Service Test Division will conduct further tests with the arrival of warmer temperature and will be putting out the word. ●

The Right Slant

Angle detection units are calibrated to the nth degree—even the slightest abuse will throw the works out of kilter

By J. M. Smith, FUR Analyst

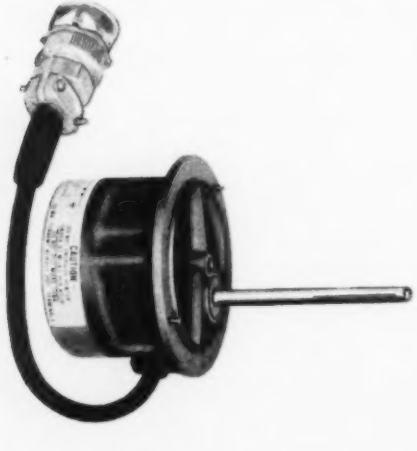
Naval Air Technical Services Facility

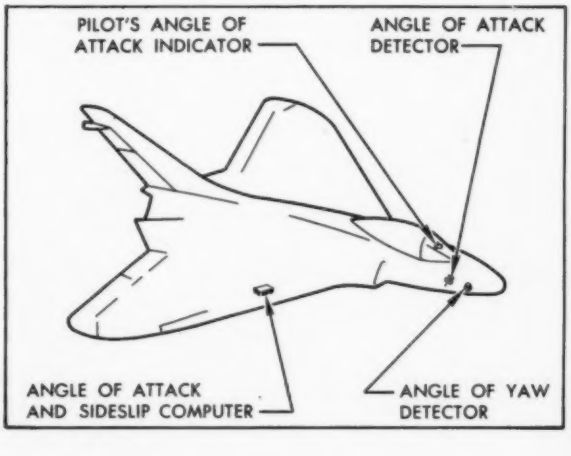
ANGLE-of-attack probes and detector units are high removal items because of poor maintenance practices. These practices stem from the lack of knowledge and understanding of the delicateness of this expensive and highly critical item. To acquaint the reader with the problem and the corrective action necessary to reduce maintenance malpractices a brief explanation of the system is in order.

Modern day high performance naval aircraft are equipped with one of several types of angle-of-attack indicating systems. These are basically electrical servo systems that can be used to indicate either the aircraft angle of attack, or angle of yaw. These precision indicating systems normally consist of three components, the detector unit, computer or relay unit, and the indicator. The detector unit is commonly called the transmitter or sensor and is used in both systems, with the only variation being the method of mounting in the airstream and the angular rotation of the probe about its axis.

The detector unit sensing element is a hollow and cylindrical probe 4" long and ¼" in diameter which is free to rotate approximately 50 degrees in the angle-of-attack system and 32 degrees in the angle-of-yaw system. The angle-of-attack probe is mounted in the airstream through the side of the fuselage in a horizontal position. The angle-of-yaw probe is mounted through the fuselage into the airstream in a vertical position.

These probes are divided into two air passages through the use of two longitudinal slots and a separator. Pressures on either slot are transmitted to a vane in the detector housing that is sensitive to any differential pressure and immediately rotates in a direction to equalize the pressure, resulting in the probe realigning the slots to a null position. This angular probe position is then translated by the use of two potentiometers, one of which operates the indicator, into electrical signals indicating the angle of attack to the pilot and the landing signal officer through the approach light circuit. The other potentiometer is used in





other computer circuits of the aircraft fire control systems.

To understand the sensitivity of the detector unit it will be necessary to analyze some of the design features of the system as stated in the various manuals supplied by the manufacturers. The detector is so sensitive that any change in probe position will cause a potentiometer output signal change to an accuracy of 0.1 degrees at airspeeds in excess of 90 knots. The indicator is calibrated in increments of 2 units from 0 to 30, cover an angle of attack range of -10 to 40 degrees. Indicators are also equipped with an index setting mechanism to enable the pilot to compensate for aircraft loading and aerodynamic conditions. The overhaul manuals prescribe a concentricity check with a dial indicator during overhaul of the probe, with the maximum allowable runout at any point along the entire probe length being 0.0003 inches. After final assembly at overhaul of the detector unit it is calibrated aerodynamically to within a tolerance of 0.1 degrees at a velocity of 110 knots in a wind tunnel test unit. With these facts in mind it now becomes apparent that the general condition of the detector probe is of the utmost importance if this indicating system is to be reliable and trusted by the pilot.

The majority of the detectors that are processed into the overhaul activities have been found to have bent and damaged probes, and reports received from the operating units indicate that these probes are damaged by mishandled access ladders, work stands, and other ground handling equipment. A similar situation prevailed in past years with the outside air temperature resistance bulbs, until personnel became educated in their care and protection.

To prevent damage to, and dirt or water from entering the probe while the aircraft is on the ground, a protective cover with a warning streamer is supplied as initial equipment by the manufacturer. These covers *must be removed prior to flight* and at any time that the heater circuit is energized. Personnel removing this cover must be *extremely careful not to impose any side load or stress on the probe.* The cover must be removed in a straight line and not just pulled off while passing by or while reaching across the aircraft.

Aircraft handbooks include cautions concerning the care to be used in removal of probe cover. This probe is no match for the rough treatment that can be dealt out by a carelessly moved work stand, ladder, air hoses and other equipment that are being used in the immediate area during the maintenance and servicing of the aircraft. Extreme caution is a *must* for personnel working in the area of this probe and other sensing elements that protrude from or are externally mounted on the aircraft such as pitot tubes, antennas, temperature bulbs, and limit switch actuators which are being damaged in the same manner.

No attempt has been made by the writer to cover any components of the angle-of-attack system other than the detector unit and its probe which is an expensive piece of equipment and continues to be a high removal item. Damage resulting from careless maintenance practices can be reduced through a concentrated effort by maintenance supervisors to educate their personnel on the care and protection of these delicate probes. A study of the system and components by all concerned will result in greater reliability of this important indicating system. A summary of the rules that should be observed to attain this desired increased reliability are as follows:

► Keep dirt and water out of the probe by use of protective covers.

► Remove covers prior to flight.

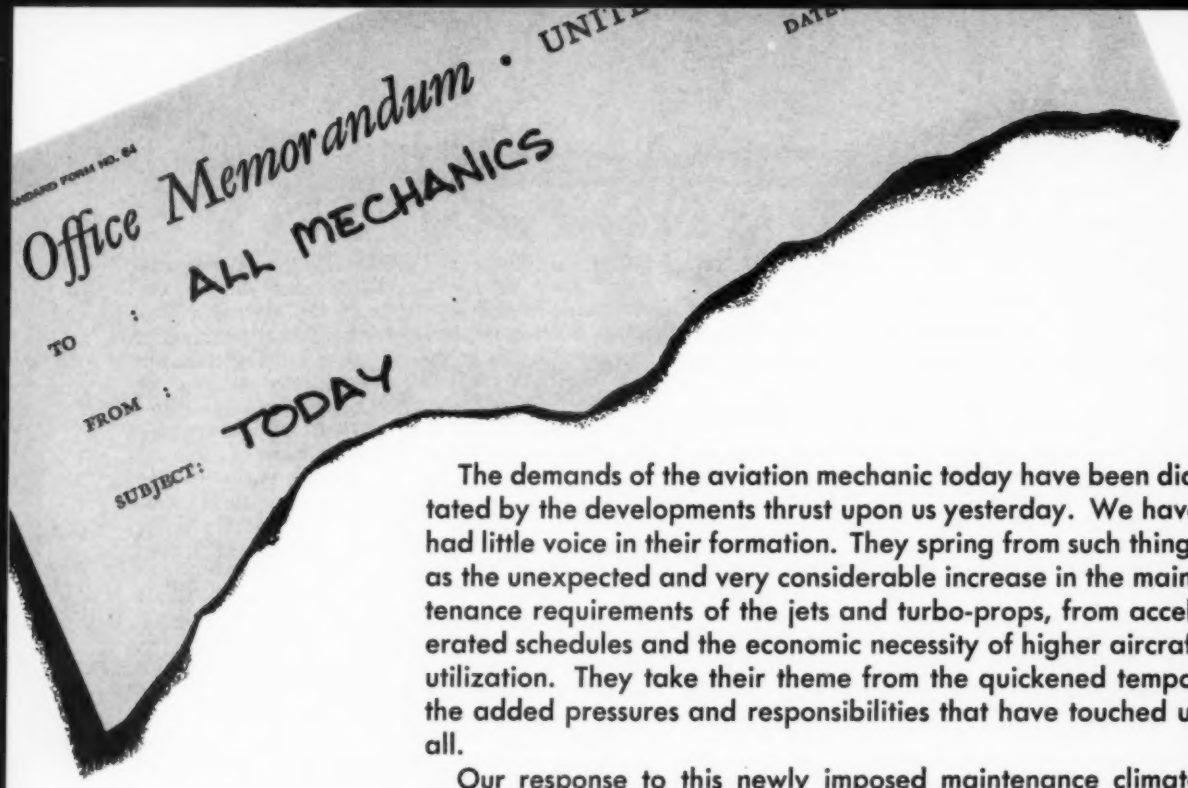
► If covers are lost—replace them by local fabrication if necessary.

► Remove covers in a straight line being careful not to impose any side load or stress on the probe.

► *Do not* use the heater circuit on the ground except for test purposes and then allowing the heater to warm only long enough to assure that the unit is heating.

► Exercise care when moving equipment or the aircraft to avoid damaging the probe. Aircraft in flight with a damaged probe could set up a hazardous condition for a pilot.

► Study and acquire a complete knowledge of the system and its operation. ●



The demands of the aviation mechanic today have been dictated by the developments thrust upon us yesterday. We have had little voice in their formation. They spring from such things as the unexpected and very considerable increase in the maintenance requirements of the jets and turbo-props, from accelerated schedules and the economic necessity of higher aircraft utilization. They take their theme from the quickened tempo, the added pressures and responsibilities that have touched us all.

Our response to this newly imposed maintenance climate will, appropriately enough, be new demands. But because much of the help we seek is to be found within ourselves, we should make the following demands of ourselves:

► *Pride*—Initials on a work sheet should be a proud proclamation that the signer has completed the job and expects credit for having done it well.

► *Confidence*—to assume responsibility rather than slough it off on Engineering and Inspection.

► *Craftsmanship*—doing the job correctly because that is the way it should be done.

► *Respect for Authority*—the authority of directives and the maintenance manual.

► *Curiosity*—to ask, "Why did this part fail?" "How can we prevent a recurrence?" to ask, "What lies ahead? What will I need to know next year?"

► *Integrity*—which covers a multitude of virtues, truthfulness, honest work for honest pay, a willingness to run now and then if walking would mean a delay, a willingness to admit mistakes.

If we supply these six demands in abundance we will be certain of a better, safer, happier career.—*"FSF Bulletin"*

CRIPPLED CAT

AN F4D-1 was spotted on the port catapult for an afterburner launch. Upon receiving the turn-up, the pilot advanced the throttle and the engine accelerated normally. Afterburner was ignited, the pilot gave a hand salute, and the launch signal was given. It was immediately apparent that the aircraft was accelerating much too slowly. The pilot came out of afterburner about one third of the way down the catapult in an apparent attempt to stop, but the aircraft continued over the bow and contacted the water about 25 yards ahead of the ship in a wings-level, slightly nose-high attitude and was struck by the ship.

An immediate air/sea search was commenced. The pilot's helmet, forward portions of the drop tanks, and a piece of the radome were all that were recovered.

Investigation revealed that before the launch the No. 3 and No. 4 hydraulic pumps of the port catapult were discovered to be defective due to an electrical discrepancy. Launching valve locks were put into place by a catapult crewman, thinking they were necessary during the performance of maintenance, and were inadvertently left in place after the maintenance was completed, unknown to the leading CPO.

Recorded end speed was 51 knots. Steam pressure after the shot was recorded as 247 psi.

The accident board said this accident was primarily the result of personnel error in that the launching valve locks were inadvertently left installed at the time of the fatal catapult launch.

Supervisory error was a factor in that the catapult crew was poorly coordinated in their various functions and failed to follow a set procedure that would insure that the catapult was fully ready for normal operation.

The manning level of the carrier catapult crew is such that the temporary loss of one trained individual presents a serious handicap. The AAR Board recommended:

1) That the manning level of the catapult crew aboard carriers be brought up to a level that will permit the manning of all stations with fully qualified operators during unavoidable absences of key personnel.

2) That a complete functional inspection, including test shots, be made of catapults following corrective maintenance of any type.

3) That zero altitude ejection seats be installed in all fleet jet aircraft.

TEFLON HOSE, HANDLE WITH CARE—Teflon has been around for quite a few years but its use in aircraft until just recently has been primarily as back-up rings and gaskets in hydraulic components. Now we have the Teflon hose and, in this application, its use is increasing rapidly. It is expected that more aircraft in the future will be using it and therefore it is perhaps time for mechanics to get better acquainted with the product.

Teflon is compounded from a tetrafluoroethylene

resin and processed under extremely critical conditions. To form a hose the compound is extruded into tube shape of desired size and then stainless steel wire is braided over the outside to provide strength and protection. This hose is chemically inert and is unaffected by fluids normally used in aircraft. Moreover it will hold up well in temperatures ranging from —65 to +500 F. For these reasons Teflon is used primarily in hydraulic and engine lubricating systems where temperature ranges and pressures preclude the use of rubber hose. Presently the trend is for higher operating temperatures and pressures in aircraft systems, so more Teflon hose is expected to be used in the future.

Although Teflon hose performs well in its specified functions it is not a super hose. In fact it has certain peculiar characteristics that demand understanding and attention. A chief factor limiting the handling of Teflon hose is the semi-permanent set it assumes after exposure to high fluid pressures and temperatures. Any excessive bending or twisting in this state will cause kinking and severe weakening of the tubing wall. Hidden by the outer layer of braided wire this weakened area may elude the searching eyes of the mechanic and perhaps fail later while the aircraft is in flight.

Evidence of mishandling of the Teflon hose was discovered in a recent survey of numerous failed hoses and a review of maintenance procedures on the F8U. Almost without exception the failed Teflon hoses were those used on the utility hydraulic system located in the engine accessory section. Failure was induced when this particular Teflon hose was excessively bent when it was disconnected from the engine driven utility hydraulic pump and reconnected to the heavy and unsupported hoses of the hydraulic system test stand during ground testing. As a suggestion one squadron overcame this problem by constructing a simple adapter that could be supported onto an adjacent structural member and to which both the system lines and external hydraulic lines were connected; thus sharp bends were avoided.

The Teflon hose like any other item of equipment used on aircraft has definite limits which, when exceeded, result in failure. This article on Teflon hose will serve its purpose if the mechanic understand and appreciates that although Teflon is tough and strong it lacks the ability to withstand abusive handling. Therefore, as a reminder let's try to observe four simple rules on handling of Teflon hose:

- ► Don't exceed bend limits.
- ► Don't exceed twisting limits.
- ► Don't straighten a bent and set hose. Avoid bending opposite to set plane.
- ► Don't hang or support objects from hose.

While attempting to place the safety pin in an FJ-4B's canopy firing initiator the pilot's sleeve caught the canopy initiator rod linkage assembly moving it aft and fired the canopy off the aircraft.

In order to insert the safety pin in the canopy firing initiator the pilot must reach a considerable distance aft and down behind the seat on the right side of the canopy section. The area he must reach through is quite restricted and extreme caution must be used when inserting this pin.

It was recommended that the most practical method of installing safety pins in seat and canopy initiator be used—that is, pins be installed by standing on the starboard wing of the aircraft and reach under canopy from this position. That the procedure of reaching around the headrest from the port side or from the cockpit be discontinued. Extreme caution must be utilized at all times.—*from a PHIGA*

SHOCKER—Upon applying power to the 115-volt power cable of the Aero 13B flight circuit tester the operator received an electronic shock by turning on the power switch. This was caused by lack of ground wire in the power cable.

This situation can be corrected by installing a separate ground wire in the cable. At present the ground wire incorporated in the cable is attached to one side of a two-prong plug. This has been found to be inadequate as electrical shock is experienced 99% of the time due to the plug being inserted wrong in the receptacle. This is a polarized plug so AUW has informed us. Nothing is said of this in the check booklet for this equipment thus endangering personnel unfamiliar with this occurrence.

This equipment and results are being used on P2V model aircraft with auxiliary power unit no. 5.

This situation can also be corrected by employing a three-prong plug on the power cable end, using an extension cord and grounding to the auxiliary power unit with a clip from ground wire to power unit.—*Anymouse*

B-NUT CLARIFICATION—Thanks to Mr. P. S. Parker we have finally tracked down the origin and meaning of the term B-nut. On behalf of the Parker Aircraft Company, which originally developed the flared tube aircraft fitting, he tells us that in the original Parker catalogs part numbers were accompanied by letters to distinguish between the various types of fittings: elbows, tube coupling nuts, universal bulkhead nuts, etc. The letter "B" identified the tube coupling nut. The expression B-nut thus came to be applied to all tube coupling nuts, and wrongly applied to other types of nuts as well.

So please—to end the confusion—restrict the term to tube coupling nuts only. Better still, if exact identification is important (and it usually is), give the AN or MS Part Number, proper nomenclature, and location when referring to fittings.—*McDonnel Aircraft Corp. "Field Service Digest"*

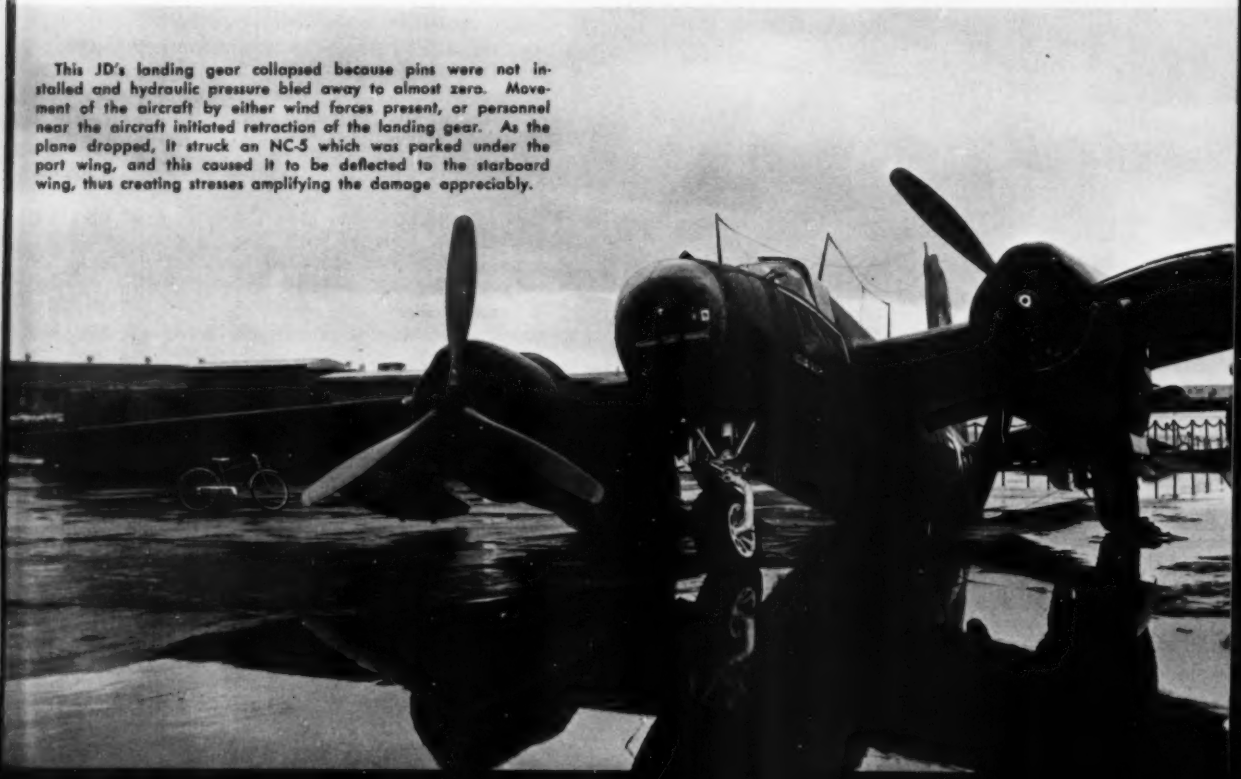
RUPTURED FUEL HOSE—The fuel flow on one engine of a military aircraft increased during cruise at 32,000 feet until it reached 2500 pounds above the other engines. All other engine instruments were normal. Before a landing could be made the engine burst into flames which engulfed the entire pod. The engine was shut down and a successful landing was made.

Investigation revealed that the fuel hose assembly had ruptured allowing raw fuel to enter the forward compressor section.

Mechanics are reminded that particular attention must be given to the proper alignment of high pressure fuel hoses. They are very susceptible to failure when twisted during installation.—*FSF Mechanics' Bulletin*

NOSE WHEEL DESIGN TRAPS WATER—A landing gear nose wheel was designed with a built-in hazard. Because there were no drain holes, a quart of water could accumulate inside the wheel and freeze, or cause unnoticed corrosion.

Ordinarily, aircraft would not experience difficulty in taking off with water entrapped in the wheel. But water frozen into a two-pound chunk of ice would unbalance a nose wheel enough to cause it to shimmy dangerously during high speed landing or takeoff. To cite an incident: Uncontrollable shimmy of an interceptor type aircraft occurred during the high speed landing roll. The severe nose wheel vibration in the horizontal plane had actuated the following circuit breakers: all four fuel boost pump circuits were OFF; ILS (in-



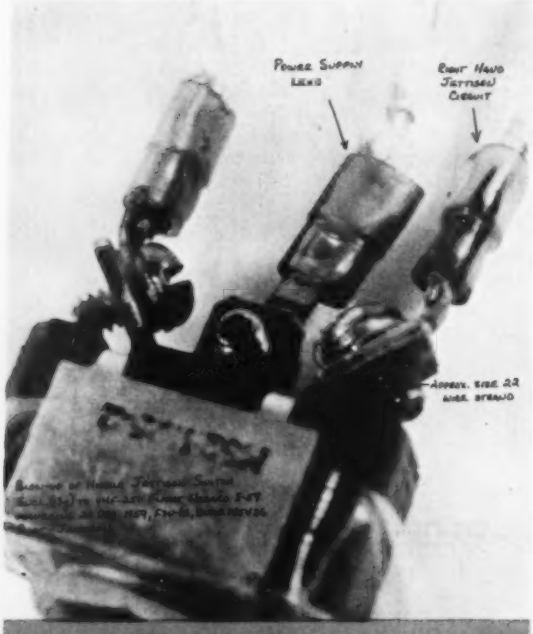
This JD's landing gear collapsed because pins were not installed and hydraulic pressure bled away to almost zero. Movement of the aircraft by either wind forces present, or personnel near the aircraft initiated retraction of the landing gear. As the plane dropped, it struck an NC-5 which was parked under the port wing, and this caused it to be deflected to the starboard wing, thus creating stresses amplifying the damage appreciably.

strument landing system), gun sight, and the right-hand leading edge flap circuits had been deactivated.

The Fix—Eight drain holes, 0.125 in. dia. were drilled close to the wheel's outer edge.—*Flight Safety Foundation Inc. "Design Notes" Bul. 62*

JAMMED RUDDER—The pilot of a P2V-7 reported rudder locked in neutral position as aircraft became airborne. After landing rudder became free again and an inspection was made of the rudder control system revealing the following:

One ¼"-28 nut adrift and during actuation of control, intermittently jamming between rudder control bracket and pulley assembly at fuselage station 105, reference IPB, AN 01-75EEB-4, Page 236, figure 54, item 35, bracket assembly part no. AN 210-5B.



CLOSE CALL

During an F8U section takeoff a sidewinder was jettisoned accidentally—the cause—a foreign object in the form of a stray piece of wire shorted the circuit between a hot lead and the missile lead. The missile struck the runway and disintegrated. There were no injuries involved in this incident. It was recommended that all jettison switches be brushed and potted and that meticulous inspections be conducted for debris such as washers, bolts, nuts and wire clippings.

LIFE VEST STOWAGE—During flight the *Beechcraft* encountered turbulence enough to cause a life vest on the left rear seat to fall to the deck near the cabin heater duct. Heat from the duct was sufficient to expand a Mk13 signal flare contained in the vest to a point the flare burst and emitted a noxious gas similar to an electrical fire. The electrical system of the aircraft was quickly secured.

The copilot upon discovering the flare in his search for an electrical fire opened the cockpit windows to eliminate the gases.

To insure that life vest pyrotechnics are protected from heat life vests should be worn or stowed properly. In this case, hangars are provided in the rear compartment.

NOSE GEAR SERVICING A3D—Nose gear loads on all models of the A3D are very critical during heavy weight (over 73,000 pounds) catapult launchings. With the nose gear oleo properly serviced, launchings at 78,000 pounds result in nose gear loads averaging from 88% to 96% of the limit strength envelope. Any slight variation from proper servicing will result in nose gear loads which exceed the limit strength envelope.

At NATC, nose gear loads as high as 111% of the limit strength envelope have been recorded without failure; however, the fatigue life of the nose gear and forward fuselage is adversely affected and subsequent failure under lighter loads may occur. To indicate the seriousness of the problem, one launch at NATC on an A3D-2P at 60,000 pounds gross weight resulted in a nose gear load of 104% of the limit strength envelope because a Schraeder valve had a slight and undetected leak which reduced the nose gear oleo air pressure by 7%.

It is recommended that the nose gear oleo air pressure be checked daily when aboard ship with a gage of known accuracy and that no launches be permitted with known mis-serviced nose oleos. Whenever low nose gear oleo air pressure is found, the cause should be corrected and the oleo completely reserviced in accordance with AN 01-40ATA-2 paragraph 2-569* before further catapult launching. Do not merely add air and/or reservice in accordance with paragraph 1-69** or the instructions on the strut engraved plate. It has been found that following the instructions contained in paragraph 1-69** does not insure complete purging of air from the oil compartment. Revisions to applicable publications will be submitted.

*A3D-2P NAVAER 01-40ATB-2 Section 2, paragraph 870
A3D-2Q NAVAER 01-40ATC-2 Section 2, paragraph 1029
**A3D-2P NAVAER 01-40ATB-2 Section 1, page 94B, Item 17
A3D-2Q NAVAER 01-40ATC-2 Section 1, page 98, Item 17

BATTERY POWER FOR FUEL CONTROL BLEEDING—Maintenance personnel were engaged in bleeding the fuel control of an FJ-4 parked on the flight line. An NC-5 connected to the aircraft was providing the necessary power to perform the operation, as outlined in AN 02B-35AAC-2 (Handbook of Service Instructions). As a result of the bleeding, jet fuel had splashed on the interior of the airframe and was flowing down the power cable to the concrete mat. The fuel suddenly burst into flames, resulting in a fire on the mat, the power cable, the interior of the airframe, and on the hands of the man performing the bleeding. Due to immediate corrective action the fire was extinguished with no damage to the aircraft or personnel. The fire was ignited by arcing in the aircraft power jack when the NC-5 cable was bumped by one of the men.

If the NC-5 plug were designed with a positive contact quarter-turn locking action this arcing hazard would not exist. The aircraft design is such that it requires the bleeding of fuel on the interior of the airframe where it flows freely and establishes a definite and unavoidable fire hazard.

To prevent future recurrence of this accident, and to reduce the fire hazard which exists during fuel control bleeding, it is recommended that the NC-5 be discontinued as a source of power for this operation, and that a portable battery pack consisting of two batteries in parallel on a small rolling cart with leads connects to the aircraft battery quick-disconnect be utilized.

It is further recommended that other units consider the adoption of this procedure in the interest of reducing a serious but unavoidable fire hazard.

Loop formed by CO_2 bottle hose on NC-5 illustrates how hose caught aileron.

CLEARANCE—A driver positioning an NC-5 to start an FJ-4B upon passing the starboard wing, the rubber hose of the CO_2 bottle stowed on the NC-5, caught and damaged the aileron tip.

CO_2 bottle stowage racks are located on the running boards. If the bottle, hose and nozzle are not secured properly the hose will form a loop which could become a hazard while maneuvering in close quarters. Investigation revealed that the clearance between the NC-5 and aircraft would normally have been sufficient, however, the loop formed by the hose on the CO_2 bottle snagged the outboard aileron tip (wings folded) bending the tip down and breaking the internal structure of the aileron. CO_2 bottles are squadron property while the NC-5s are dispatched from the motor pool. Therefore, each time an NC-5 is turned in and a replacement obtained, the CO_2 bottle, or bottles, must be switched. During an informal observation of units aboard a certain NAS 15 NC-5s assigned were examined. Five were found to have CO_2 bottles improperly stowed. Five were properly stowed and five were without CO_2 bottles entirely.

A large number of the CO_2 bottle retaining clamps were found to be in a state of disrepair which would make it possible for the hose and nozzle to jiggle loose, or lose the bottle entirely, even though originally properly stowed.

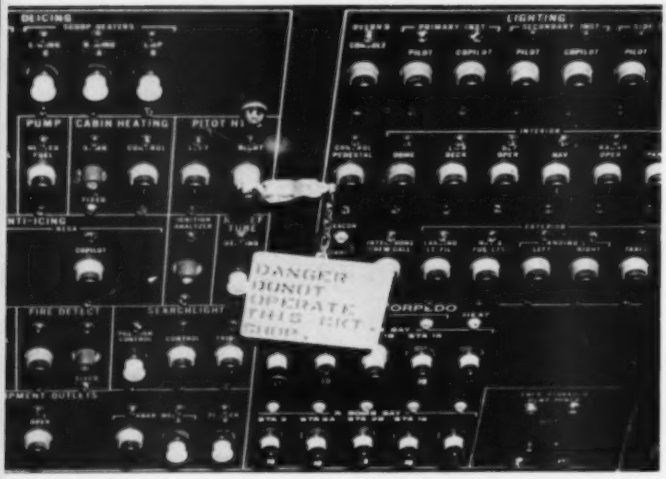
It is recommended that:

► Personnel concerned be instructed in the proper securing of CO_2 bottles in the NC-5.

► That NC-5's with faulty stowage racks and clamps, not carry CO_2 bottles until the discrepancies are corrected. (Changing the location of the CO_2 bottle is not considered feasible.)

► Proper operation of ground support vehicles around aircraft be the subject of a continuous education program.

Continued



CIRCUIT PREVENTER—A ground accident in which the varicam assembly of a P2V-7 was damaged was caused by inadvertent actuation of the Emergency Varicam. To eliminate further accidents of this type a foolproof means of isolating circuits was developed by Patrol Squadron NINE.

To isolate a circuit a preventer is applied to the affected circuit breaker as shown in the photo, (left). With the preventer in place, movement of the circuit breaker is precluded without the conscious effort of removing the preventer. This precaution prevents inadvertent operation. The materials used in the fabrication of the subject preventers were as follows:

a. Clip Type 45 RN5940-245-7221-D336

b. Chain, Safety 2/0 Stainless R4010-262-1548-GH80

c. Aluminum Scrap.

100 preventers can be produced for the expenditure of 8 manhours at a cost per unit of $0.15. ●

Quality Control Pays Off

Salvatore J. Pignatelli, AD1, of the Floyd Bennett Naval Air Station, Brooklyn, New York, earned a commendation from his commanding officer, for detecting material failures in aircraft.

Pignatelli found a severely cracked tail rotor gear box flange on an HSS-1 which would have led to complete failure of the entire rotor installation within the next five hours of flight operations.

In another case he found a defective elevator bellcrank in the horizontal stabilizer of an S2F-1. Further progression of this failure would have resulted in complete elevator control loss. This detection led BuWeps to issue an urgent action category aircraft service change which replaced 47 bellcranks in S2F aircraft.

While inspecting a P2V Pignatelli discovered that an elevator cable had severely chafed the main fuel line. As a result, a flight safety directive was issued to all activities concerned.

Pignatelli's meticulous inspection prevented what would have probably been serious aircraft accidents and possible loss of life. From APPROACH to Inspector Pignatelli—WELL DONE!

MURPHY'S LAW*

The proper hookup calls for wires to terminals as follows:	T	1	W	268
		2		242
		3		264
		4		92
		5		246

THIS is a clear example of Murphy's Law. Four leads were cross-connected during replacement of the landing gear switch in an SNB—two of them in such a way as to allow a completed circuit to the up side of the landing gear motor when the ground safety switch was closed, regardless of the gear handle position (photo above).

Factors contributing to this accident were:

This job was not inspected by a qualified inspector.

The landing gear was not drop-checked after a change of a landing gear system component.

The aircraft was released for flight prior to the aforementioned procedures being completed.

The accident board noted that inspection of the landing gear switch on this and several other SNB aircraft indicated that many of the leads attaching to the strip-fanning (Part 1-161-R) had been chafed with the insulation worn through and the chafed wire taped. These wires appeared to be worn by constant rubbing by the throttle linkage. Also, these wires are not color-coded or numbered in the vicinity of the landing gear switch installation.

The SNB-5 landing gear switch has nine electrical connections. In the aircraft involved and in all others inspected aboard this station these wires were all white, not color-coded or numbered in such a manner that the numbers are readily accessible near the landing gear switch. Good practice when changing this switch is for the man who removes the unit to draw a sketch of the wiring and tag the wires, this sketch to be used by *himself* in rewiring the replacement unit.

The accident investigation board recommended:

► Closer supervision and attention to established maintenance procedures by all maintenance personnel with respect to work-orders and inspection of completed work.

► That the leads attaching to the landing gear switch be color coded or conspicuously numbered in the vicinity of the switch in order to minimize the possibility of incorrect installation.

► That all SNB landing gear switches be inspected for chafed wire leads and such chafed leads be covered with "spaghetti" or replaced. ●

*If an aircraft part can be installed incorrectly, someone will install it that way!

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"Howdy . . . you working out an 8T takeoff too? I get 6800 feet . . ."

"Nope, I'm figuring how far away my HUS is from being able to lift off . . ."
"I thought you were doing the same thing—that a different computer?"

"Yeh, mine's for figuring whether this place has enough concrete for me to take off on . . . does it real quick and easy, and it works for all F9F-8 models."

"This computer covers the HSS and HUS models—they're making some for other helos too. It's real great—gives me my max hovering gross weights, and cranks in altitudes, temperatures and wind. I wouldn't go anywhere without it . . . in fact, right now I'm not going anywhere with it either, cause it says the load I've got is too much for that heat out there, so I'm stuck here 'til after the duty thundershower."

"Me too, so let's go find some shade and read the new APPROACH."

"Roger-dodger . . . there's a letter about these things on page 1—aren't you glad someone dreams up computers like these?"